

Below Brushing the udder prior to milking in severe weather water cannot be used to clean udders



Vaccinating young heifers is a prevention against Brucellosis

Clipping the udder flanks, and rear legs is a desirable practice in producing clean milk



THREE APPROVED PRACTICES USED BY SUCCESSFUL DAIRYMEN

Approved Practices in Dairying

SECOND EDITION



By

ELWOOD M. JUERGENSEN

University of California
Davis, California

and

W. P. MORTENSON

University of Wisconsin
Madison, Wisconsin



OXFORD & IBH PUBLISHING CO.

Calcutta

-

Bombay

-

New Delhi

Copyright, 1960

Copyright, 1952

Reprinted, August 1964

THE INTERSTATE
Printers and Publishers
Danville, Illinois



Indian Edition 1966 published by arrangement with the original American publishers Interstate Printers and Publishers Inc. Danville U.S.A.

Rs 7 00

For Sale in India, Pakistan, Burma, Ceylon and Indonesia only.

*This book has been published with the assistance of
the Joint Indian-American Standard Works Programme.*

**PUBLISHED BY OXFORD & IBH PUBLISHING CO., 36, CHOWRINGHEE ROAD,
CALCUTTA 16 and PRINTED BY K. C. CHATTERJEE AT THE ETON PRESS (P) LTD,
CALCUTTA-5**

Preface to the Second Edition

Since the first edition of this book was written much new information has been developed on the care and feeding of the dairy herd, and especially on methods of feeding calves for best success.

The results of the most up-to-date practices will be found in this new revision. We are confident that a careful study of this easy-to-read book will make dairying more interesting and profitable.

Preface to the First Edition

The *purpose* of this book is to furnish a well-rounded list of activities which involve approved practices with information on *how* they should be done in the dairy enterprise. An approved practice is a farm practice which has been tried and found to be typically successful by most people who try to use it. Not only have these practices been selected from State agriculture experiment stations but from successful farmers in the community as well. Therefore, it is important that a dairyman know what these practices are and how to carry them successfully to completion if he is to attain real success in the livestock industry. A suggested list of approved practices is listed in the appendix.

The *primary aim* has been to include all of the more important activities involving approved practices in the dairy enterprise. Therefore, the information has been carefully selected and condensed to a minimum in order to present to the reader only those activities involving approved methods of dairy farming. One of the main ideas has been to say *how* to perform each approved practice.

Because of the fact that dairying varies greatly throughout the country it seemed a wise idea to get as great a range of information as possible in preparing the book. For this reason two authors representing vastly different sections of the country have collaborated in preparing the manuscript. These people, one from the well known dairy state of Wisconsin and the other from California, which has typical western conditions, have been able to correlate their thinking and ideas so that the book should have a wide range of usefulness to dairymen everywhere.

This book should be useful to dairymen; farmers,

including full or part time and suburban; FFA and other vo-ag students; teachers of vo-ag; 4-H club members; county ag. agents; those contemplating entering the dairy industry, as well as all persons interested in efficient dairy production.

THE AUTHORS

Acknowledgments

The authors wish to express their appreciation to everyone who helped in the preparation of this manuscript. They are especially indebted to Eugene Tuft, well known dairyman, El Nido, Calif., for his many practical and worthwhile suggestions as well as Kathleen Tuft who proofread the book. To all those who furnished photographs and sketches, the authors are grateful and have tried to credit each drawing or picture as it appeared.

Many commercial companies have generously contributed of their time and advice, as well as material contributions in the form of photographs.

Most important has been the wealth of information supplied by the U.S.D.A. and the many State Universities and Colleges. The authors have drawn freely upon colleges and experiment station circulars and bulletins of the following states:

California	North Dakota
California Polytechnic College	Ohio
Cornell	Oklahoma
Florida	Oregon
Iowa	Texas A & M
Michigan	Virginia Polytechnic Institute
Missouri	Wisconsin

The presentation of this valuable material would not have been possible without the splendid cooperation of all concerned and the writers cheerfully acknowledge their aid and contributions.

THE AUTHORS

OPPORTUNITIES IN DAIRYING

The progress of mankind and civilization has, since history began, been closely allied with his diet. Even today the leading nations and nations capable of becoming strong are those which can obtain food in abundance for their people.



Courtesy of Conservation Service

Fig. 1-1—Good type dairy farm that gives satisfaction to the operator. Dairy farms must be large enough to support an adequate number of cows if they are to be prosperous.

Milk is a remarkable combination of food elements. It represents the perfect food for man more nearly than any other natural food. An adequate consumption of milk can correct dietary deficiencies for most people and thus produce strong, healthy bodies. It is a delicious and appetizing food as well as being healthful.

Dairying, then, not only represents one of the basic

agricultural industries, but is a pleasant, satisfying way of life for thousands of people now engaged in producing milk and milk products and for many, many more who will be so engaged in the future.

It has been often said that the cow is a machine; a machine that converts raw materials (plants) into food in a surprisingly efficient manner. The method by which cattle are managed in order to produce milk can be accomplished in many ways. In order to be most successful, dairymen, or those contemplating entering the business, should carefully survey their own situation so as to determine which method will produce the best results under their particular local conditions. Following are several methods by which dairying is carried on throughout the nation:

The Family Cow

Back through the years the family cow has been common on American farms and also in towns and the smaller cities. Abraham Lincoln had a family cow in the city until he became president of the United States.

In recent times the towns and cities have for the most part said "good bye" to old "bossy" but there are still thousands of farms, large and small, where a single cow is kept.

The sole purpose of such an animal is to supply milk and its many by-products for the family. Many of these farms may be fruit or truck farms, and have no other livestock on them other than perhaps a few chickens. On the other hand, large beef ranches or other such establishments may keep one or two dairy cows to supply dairy products for the farm family and the immediate hired help. The advantages of the family cow are many, provided a cheap source of roughage is available with which to feed her. An abundance of fresh milk and cream is produced for the farm family at little or no accountable cost, as the care and labor involved



Fig. 1-2—An ideal family cow. She not only provides milk and all its products, but also a heifer to sell or veal to eat.

in milking seldom affects other operations as someone must be around anyhow morning and evening. At least one veal calf can be produced yearly without materially lowering the milk supply for the table. It is not necessary that the dairy operations with the family cow be as efficient as those on a regular dairy. Odd milking hours are not disastrous and peak production means little, as one cow will generally produce more than enough for one farm. It is extremely important that the family cow be absolutely free from all known diseases, such as T.B. or Bang's disease, that can affect human health. Home produced milk is seldom pasteurized even though home pasteurizers are available, and for this reason, disease-free cows producing disease-free milk are essential. There are disadvantages to the family cow, the main one being the monotony of having to milk every night and morning. However, if a veal calf is kept on hand, it can be allowed to run with the cow to suck, should no one be available to milk for a day or so. Anyone contemplating having a family cow should first see that cheap roughage is available or it may be more advantageous and sometimes even cheaper to purchase milk.



Fig 1-3—Veal calves may be a desirable way to market milk under certain part-time farming situations. Market demands vary somewhat, but many markets prefer calves 3-4 months old weighing about 225 to 250 pounds.

Producing Veal

A few farmers keep dairy cows for the sole purpose of producing veal for market. Generally these people do other kinds of farming in addition, and do not have time to milk the few cows they have, but prefer to put two to three calves on a single cow and produce veal. Normally, about ten pounds of milk is required in order

to produce one pound of veal. Therefore, this is considered by many to be an inefficient method of marketing milk as the veal yielded is worth less than the milk consumed. However, farmers carrying on such a practice say they would not milk the cows anyway, and if they are located in an area with a good veal market, maintain they can make more profit by this procedure than with any other kind of livestock. Cows used in this type of dairying must be well fed, as all available milk is taken from them by calves continually sucking. In addition, they must be of such a temperament as to let any calf nurse or will cause considerable labor difficulty. It is important to have a good source of young calves of the proper breed. Holstein calves are especially desirable for veal calves and generally show more profit; however, they are also most difficult to obtain for this purpose. Disease is always a problem in raising young calves even if they are nursing. Therefore, all adequate sanitation must be in force continually. The veal market and source of calves should be carefully analyzed by those desiring to produce veal commercially.

Part-time Dairying

A considerable number of farmers keep a limited number of dairy cows to produce part of their income, but devote extra time to other duties. Some may carry on other types of farming, such as field crops or truck crops, and still have enough time to do chores and milk six, eight, or even twelve cows or so. Other people may hire out during the daytime to other farmers or even in nonagricultural industries, but still have surplus hours they wish to sell by caring for a limited number of dairy cows. Even if labor costs are considered negligible in such instances, part-time dairying is not economically feasible unless a cheap source (generally home grown) of roughages is available. Other



Fig. 1-4—A few cows like this fit well into a part-time farming situation. Even in this type of farming quality of cows is an important factor.

costs may be higher than on a larger dairy, for example, bull cost per cow is higher, overhead for milking equipment and buildings is higher with a smaller number of animals. However, if feed is available, part-time dairying is generally a profitable kind of farming. Many farmers with small acreages like the idea of having the benefits of manure to spread on their cash crops and an operation, like milking, that can balance their use of labor.

Seasonal Dairying

Dairying in which dairy cows are milked part of the year and then dried up and turned to pasture before their normal lactation has ended is termed "seasonal dairying." This type of dairying is confined to rather definite geographical areas or other conditions that would make such practices desirable. As a general rule, natural feed conditions govern whether or not seasonal dairying is to be carried on. Certain areas on the Pacific

Coast practice seasonal dairying because rainfall produces an abundance of feed for five or six months of the year and then dries up for the remainder of the season. Cows are milked and bred to calve so they will be in their greatest lactating period during the growing season of the native grasses. When the grass turns brown the cows are turned dry, as there are no longer sufficient nutrients in the forage to continue milking profitably, and the surrounding terrain is not suitable for cultivation. In the mountain areas, cold weather also produces conditions that call for seasonal dairying, which has its peak production in the summer. Occasionally a few commercial dairies will breed their cows so that practically all will be dry the same month during the winter as a means of the farmer getting a vacation. While any breed would respond to seasonal dairying, dual purpose breeds are used more often under these conditions. Dual purpose cattle tend to "rustle" and maintain or put on weight during the dry grass period better than straight dairy breeds. Should the owner wish to dispose of surplus animals or young stock for meat, these breeds also yield good carcasses. Seasonal dairying is considerably different than regular dairying in many respects. While gross returns are often much smaller with the same number of head of stock, production costs are generally low enough to make this type of dairying profitable with proper land or climatic conditions.

Commercial Dairying

The greatest single source of milk is the large number of commercial dairies scattered throughout the country wherever an abundance of roughage is available. This factor must not be overlooked, as the first consideration for a successful dairy is an ample supply of pasture or hay economically produced so dairying will be profitable. Most commercial dairymen prefer to buy concentrates elsewhere. Cows in these herds num-

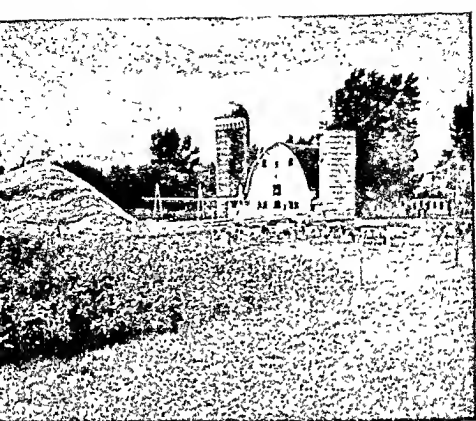


Fig. 1-5—What could be a finer goal than to own a good commercial dairy like this one?

ber from 20 to 25 up to several hundred or even a few herds with a thousand or more. However, the majority of herds will have in the neighborhood of 50 to 60 milking cows.

Three types of dairying may be carried on:

1. **Market milk**—Milk produced under strict sanitary requirements of city and state is generally called "market milk" or "Grade A" milk. It brings a higher price than manufacturing milk, but requires better buildings and more equipment for cooling and handling. This milk commands the greatest price, but generally has slightly higher production costs.
2. **Manufacturing milk**—All milk, other than market milk, is called "manufacturing milk." Sanitary requirements on the farm are not as strict, as the milk is manufactured into butter and other dairy products.
3. **Separated milk**—Some dairies separate their milk

and sell cream for cash, and feed the skim milk to livestock, particularly to swine.

While milking conditions, particularly with regard to sanitation, vary considerably under the three types just outlined, other production factors are much the same.

If feed conditions are favorable; labor is the next most important item to consider. Most successful dairy-men prefer to have more cows than one man could easily handle and hire additional help if family labor is not available. This makes the burden of milking less, and the extra cows more than make up for the added labor cost. Should one man become ill or unavailable for some other reason, the second person can care for the herd successfully until help is located. Two men so employed also make dairying more enjoyable and less confining.

The quality of cows is an important factor of success in any commercial dairy. One cow producing 300 pounds of butterfat yearly is likely to yield more profit than 10 cows giving only 100 pounds per cow.

It is possible to start with a small number of cows, and by a sound breeding program increase the herd to a profitable commercial dairy.

Availability of market, feed, labor, and high quality cows together with a genuine interest in the dairy enterprise are essential factors for a person to consider in starting or maintaining a successful commercial dairy.

Corral Dairying

Corral or dry-lot dairies are common in some parts of the nation. The chief characteristic is that no feed is produced and few calves are raised. Replacements as well as feed are purchased elsewhere and brought in. Obviously, production costs are high, therefore there must be some compensating factors. Such dairies are

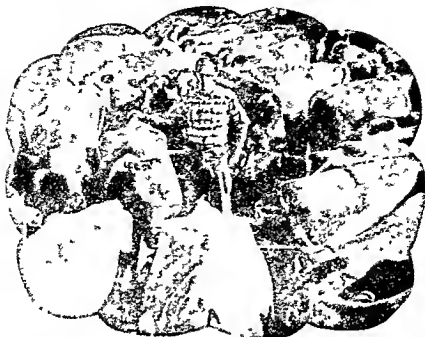


Fig. 1-6—Typical corral dairy. These cows are representative of several hundred head which make up a corral dry-lot dairy on about 10 acres of land.

found, therefore, only in high-cost areas around large metropolitan centers where fluid milk commands a good price in order to make this type of dairying possible.

Corral dairies resemble a factory more than a farm. A division of labor exists and a high peak of efficiency is maintained throughout. Milkers, for example, have no duties other than milking. Numbers of cows are usually high, several hundred or more, so as to produce an even flow of milk year round and employ labor efficiently. Machinery is utilized as much as possible under dry-lot dairying conditions.

Purebred Dairying

In reality, purebred dairying is no different than other types, especially with regard to physical facilities and other production factors except that registered cattle would be used. In addition, purebred dairy cattle could be kept under any of the previously outlined



Courtesy of Conservation Service

Fig. 1-7—A purebred herd of excellent cows. Good registered cattle should be superior producers if they are to justify the larger investment.

types of dairying. However, the number of registered cattle is limited and production costs as well as initial costs are high. Gross income is also higher due to generally greater butterfat production per cow and sale value of surplus animals raised. The purebred industry is a long-time proposition, as a newcomer seldom is able to sell his surplus stock for prices comparable to what he had to pay for foundation cattle. Therefore, it is extremely important to manage the purebred herd so it is a paying proposition under commercial conditions. Additional income from sale of animals must come later after reputation and experience are gained. Good quality registered cows should, of course, be high butterfat producers and thus warrant the extra first cost in obtaining them. While this may often be true, those interested in producing purebred livestock must realize registration fees, cost of showing, advertising, etc., may also raise production costs. If registered cows are

not superior producers, they are of no greater value than unregistered cows.

Some dairymen with an ordinary grade herd follow the practice of purchasing a superior herd sire and a few purebred calves or bred heifers so that over a period of years they can evolve a good purebred herd.

Replacement Heifers

A large demand exists for good quality replacement heifers. This is particularly true in the market-milk areas near large cities where corral dairying is practiced and all replacements must be purchased. An active market exists, however, for good replacements in any dairy community. Under this system calves are raised on milk substitutes until they can graze for themselves and then grown out, bred and sold as "springers." The best price is generally obtained just before they calve as the heifers are in peak bloom and buyers take the least risk in obtaining a good producer. Furthermore, the buyer does not have to maintain the animal long before she begins to produce.

The advantage of this way of dairying is that the labor involved in milking is eliminated and cheaper feeds, as a rule, can be used than with producing cows. Rough land and areas remote from markets are suitable for raising replacement heifers as is the case with beef animals. Furthermore a "springing" dairy heifer will generally bring a much higher price than a beef animal of equal weight. Oftentimes good quality calves can be obtained from various sources and nurse cows used to raise the calves to the point where they can obtain most of their feed from grazing and limited supplements.

People who cannot dairy full time or young folks starting out might find it worth their while to investigate this segment of the dairy business.



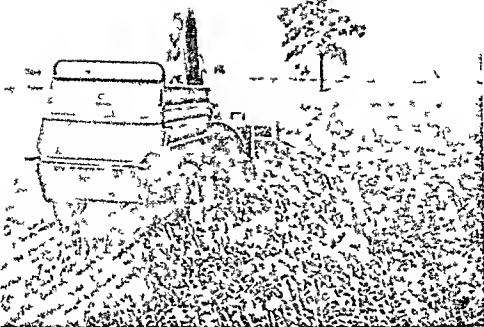
Fig. 1-8—Fine group of replacement heifers. Markets near large cities are particularly good outlets for selling springing heifers.

Cow Pools

A recent development in the dairy industry is the advent of the cow pool. These operate somewhat like the custom feed lot with beef cattle. Under this system a number of different dairymen move their cows to a central lot or "pool" where the cattle are fed and milked while in lactation. Cost of feed and operation is prorated and deducted from the owner's milk check. Sometimes the cows are taken home when dry and returned after they freshen. However, many pools keep the cows year round. The advantages are many among which would be the obvious one of being "big" so that volume could command a better sales outlet, use of resident veterinarian, use of the best bulls, volume buying, elimination of milking chore, etc. However, there are obvious disadvantages to the individual dairymen. Under this program some people have used it as a means of getting started or investing in agriculture without owning any land.

Future Trends in Dairying

The methods of farming, including dairying, have gone through constant changes in the past and change will continue in the future. A dairyman will be more



Courtesy New Holland Machine Co.

Fig 19—Forage harvester with direct cut attachment at work in sorghum. Spreader with box is being towed. Machines like this are influencing the future of dairying

successful if he keeps abreast with the changes that he will be facing

Dairy farms will grow larger. A commercial dairy of 50 to 100 cows will not be uncommon and many will have herds much larger. Corral dairies with herds numbering several hundred cows are common and occasionally some with several thousand.

On the larger commercial dairy farms more and more dairymen are keeping their cows confined in a small feed lot even during the summer pasture season.

These cows do not go out on pasture, but are fed roughage in the feed lot. There are several ways used to furnish this feed. Some cut green feed and blow it into self-feeding wagons. These can be hauled to different parts of a feed lot so no area gets too messy.

Another method is to have feed bunks in a surfaced barnyard. Then the green feed is chopped and blown into a large self unloading wagon box or truck. This is then unloaded in the feed bunks as the load is moved along.

Another procedure is to chop the green feed and put it in silos. A silo unloader is used which delivers the silage into a feed bunk where the silage is distributed the entire length by an auger operated by an electric motor. This will probably become more common in the future. It will require silo capacity of around 15 to 18 tons per cow when fed the entire year. Some large dairymen are now building silos 30 feet in diameter. Under this system the dairy herd does not get out on pasture at all. It is sometimes referred to as the zero pasture plan. Pelleting feed into large wafers may become very important in the future as it completely mechanizes the roughage end of feeding.

There are three important reasons why the size of dairy herds and dairy farms will increase. The first is that large farm machines and types of equipment have been developed in recent years. Many of these have automatic labor saving features. For the most part they are adapted for large operations which means that they bring about the greatest savings on larger farms. The milking parlor with the pen barn is increasing in popularity and is more economical with a large than with a small dairy herd. Mechanical feeding equipment and barn cleaners are also being used more and more and work most economically on larger dairies.

The second reason why dairy farms have become larger is that wage rates of hired labor have gone up so farmers have been induced to buy labor-saving machines. The third reason is that the expenses of operating a dairy farm are much higher than they were some years ago so a farmer must have a larger income, hence a larger herd. The trend toward larger dairy herds is almost sure to continue in the years ahead. Many present dairymen will buy neighboring farms to enlarge their operating units.

Vertical integration—Another trend is also taking place in some types of agriculture. This is called "ver-

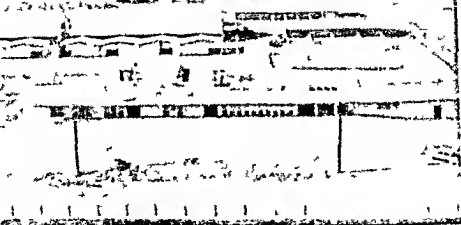


Fig. 1-10—New Dairy Research Center, University of California, Davis. The future of dairying will be tremendously influenced by new developments in production, processing, and marketing.

tical integration." By vertical integration is meant linking together of two or more steps in production and marketing. While not currently as prevalent in the dairy industry as in some other types of farming, vertical integration is a factor in the future of dairymen. To some degree farmer-owned cooperatives are a kind of vertical integration. Dairymen should be aware of the advantages and disadvantages of this kind of expansion so they can intelligently guide their own program should this development become a problem in the future.

CHAPTER II

SELECTING THE BREEDING HERD

Desirable breeding stock essential—Several breeds of cattle in the United States are recognized as dairy breeds. Although much alike in what is known as general dairy conformation, these breeds differ widely in certain characteristics. What these characters are, the factors to consider in selecting a breed, the purpose and adaptability of breeds are questions of interest to both the beginner and the established breeder of dairy cattle. In order for the dairyman to be successful in the dairy business, he should understand how to select proper breeding stock.

Suggested Activities Which Involve Approved Practices

1. Selecting an approved type of dairying.
2. Selecting a suitable breed.
3. Selecting desirable cows.
4. Selecting desirable heifers.
5. Selecting a desirable herd sire.
6. Know where to find information.

1. Selecting an Approved Type of Dairying

There is no one best breed or type of dairy animal that will satisfactorily meet all market or farming conditions better than any other kind of dairy animal. Therefore, it is important that the producer realize the factors on which he should base his selections.

Choose a type whose products conform to market demands—Some milk markets favor high-testing milk and at other times or in other markets, they may favor milk with low butterfat test. Many areas, close to large

centers of population, have a steady demand for fluid milk, whereas the demand in more remote sections may be for cream. Certain areas pay unusually well for veal so that the value of this by-product cannot be overlooked. Therefore, it is a desirable practice to consider what the market most desires when selecting dairy animals.

Select a type adapted to local climate and type of farming practiced—Some areas have an abundant supply of feed available for just a few months each year.



Courtesy Soil Conservation Service

Fig. 2-1—A well adapted type of cattle that best suits the kind of farming. These southern cows are grazing a field of kudzu planted on a critical slope.

Under such conditions, cows are freshened to lactate during this season and are "dried up" for the remainder of the year. Dual-purpose breeds are often used under such conditions.

Select a type that best suits your farming—Dairy-men interested mainly in producing milk or cream for market and not in selling breeding stock, usually raise

grade cattle. Likewise farmers raising other crops or livestock besides dairying, and who desire to spend no more time than necessary on their dairy operations, prefer a grade herd. However, those specializing in dairying and who desire to produce breeding stock in addition to dairy products, most often raise registered cattle. This type of farming takes extra labor, equipment, and bookwork, as well as a greater investment in capital per animal. Therefore, dairymen should carefully consider the type of dairy farming that best meets their farming conditions.

2. Selecting a Suitable Breed

According to Farmers Bulletin 1443, too much emphasis is often given to the question of which breed to choose and too little to the matter of getting good individuals, that is, those that are well bred and are high producers. There are some important points, how-



Courtesy Ayrshire Breeders' Association
Fig. 2-2—Mature Ayrshire cow. These animals are well known for their excellent symmetry and balance of dairy type.

ever, that should be considered in deciding which breed to select.

Choose the breed that predominates in your locale—It is difficult for an isolated small breeder to dispose of his surplus stock to advantage, while if there are many breeders with the same breed, buyers are attracted to that area. Dairymen having the same breed can exchange bulls or own good registered hulls, co-operatively. Community action is often more successful if there is one breed throughout the area.

Choose the breed for personal reasons—A person that has a liking for one breed is naturally going to do a better job of caring for his animals than for those of a breed he does not like. However, personal preference must not overshadow the matter of quality of individual animals, for it must be remembered that a dairyman soon begins to like the breed with which he is doing well.

Breeds of Dairy Cattle Common to U. S.

Ayrshire—The Ayrshire breed originated in southwestern Scotland. In the United States they are most numerous in the northeastern states. They have well built, stocky bodies, not heavily covered with flesh, but give the appearance of great vigor and vitality. Calves weigh from 60 to 80 pounds at birth. The cows are noted for their symmetrical udders which usually extend well forward and high rear with no tendency to be pendant. Average production of cows on advanced registry tests was 10,469 pounds of milk and 416 pounds of butterfat per cow with an average test of 3.98 per cent.

Brown Swiss—The original home of the Brown Swiss breed is in Switzerland. They are found throughout the United States, but mainly in the north central and eastern states. The large frame of the Brown Swiss cattle indicates that they were originally developed for



Courtesy Brown Swiss Cattle Breeders' Association

Fig. 2-3—Mature Brown Swiss cow. Brown Swiss cattle are becoming more popular in western areas.

draft animals as well as milk. The calves weigh 65 to 90 pounds at birth. The heifers are slow in maturing. According to the Register of Production, average production per cow is 12,592 pounds of milk and 509 pounds of butterfat with an average test of 4.04 per cent.

Guernsey—The Guernsey breed originated in the Channel Islands near the north coast of France. They are numerous throughout the United States, but especially so in the central states. A mature cow in milk should weigh about 1,100 pounds. Guernsey cattle are easily identified by the golden yellow pigmentation in the skin. Calves weigh 55 to 85 pounds at birth. According to advanced registry records, average production per cow was 10,079 pounds of milk and 499 pounds of butterfat with an average test of 5.0 per cent.

Holstein-Friesian—The cattle from which our present breed has descended were developed in the northern part of Netherlands, especially in the province of Fries-



Courtesy Guernsey Cattle Breeders' Association

Fig. 2-4—Mature Guernsey cow. This breed is a popular well-known kind of dairy cattle throughout the United States.



Courtesy Holstein-Friesian Association

Fig. 2-5—Excellent type Holstein bull. Holstein cattle produce large quantities of milk and are therefore very popular in market milk areas.

land. Holstein cattle are numerous throughout all states, but more so in New York and the north central states. They are the largest dairy breed and mature cows should weigh about 1,500 pounds. Color markings of black and white make them easily distinguished. Calves at birth weigh 70 to 105 pounds. According to Advanced Registry records, average production per cow is 15,748 pounds of milk and 544 pounds of butterfat with an average test of 3.45 per cent.

Jersey—The Jersey breed originated on the Island of Jersey, one of the Channel Islands between France and England. Jerseys are more evenly distributed throughout the United States than any other dairy breed. They are the smallest of the common breeds, as



Fig. 2-6—A fine group of Jersey heifers. Jerseys are noted for their high butterfat percentage. Large type Jerseys are one of the most popular breeds in America.

a mature cow in milk will weigh around 1,000 pounds. Heifers develop rapidly and often mature sufficiently to calve the first time at 24 months of age. Calves weigh from 40 to 75 pounds at birth. According to Register of Merit production records, average produc-



Fig. 2-7—A fine group of replacement heifers. The best way to develop and improve the dairy herd is to add cows grown out from calves like these.

tion per cow was 8,636 pounds of milk and 463 pounds of butterfat with an average test of 5.36 per cent.

Red Danish—The Breed of American Red Danish Cattle has been established through the joint effort of the United States Department of Agriculture, working with farmers in three Michigan counties, and Michigan State University. The breed is now becoming quite widely spread throughout North America, Alaska, and a few in Central America.

The U. S. D. A. asked E. L. Anthony, now retired, Dean of Agriculture, Michigan State University, to go to Denmark and get a few good Red Danish Cattle. He selected twenty females and two males, shipping them to the U. S. D. A. Experimental Farm at Beltsville, Maryland.

As the herd prospered, a group of farmers in Sanilac County, Michigan, accepted the offer of the U. S. D. A. to prove the bulls. The results of crossing the bulls on native cattle were so satisfying that it was decided to develop a new breed.

Now 305 day records of 500 pounds of butterfat or more are common in many herds made on two times a day milking, under ordinary farm conditions.

With the assistance of Michigan State University,



Courtesy American Milking Shorthorn Society

Fig. 2-8—Dual purpose breed. Milking Shorthorn cow and calf. These cattle are popular in areas where seasonal dairying is practiced.

the farmers established, in January 1948, The American Red Danish Cattle Association.

Dual-purpose breeds—There are several dual-purpose breeds among which the Milking Shorthorns are the most numerous and popular. Strictly speaking, all cattle breeds are dual-purpose as all produce some milk and yield meat for human consumption. While on the whole dual-purpose breeds do not compare favorably with strictly dairy breeds from the standpoint of milk production, they do yield a much superior beef carcass.

Other dairy breeds—There are several other dairy breeds, for example, the Dutch Belted. However, at present these animals are not numerous nor do they have too general a distribution.

Select for individuality—The point to keep in mind is—there are good cows and poor cows in all breeds, and other things being equal, the dairyman who gets good individuals to begin with and properly cares for



Courtesy Red Poll Cattle Club

Fig 29—Red Poll cow This large cow is representative of another breed of dual purpose cattle.

them, will have a good chance for success regardless of the breed he selects

3. Selecting Desirable Cows

Purchase stock from reliable breeder—Oftentimes it is impossible to recognize defects in dairy cattle, even for experienced dairymen. Therefore, it is important, especially for the beginner, to buy his foundation animals from a reputable breeder. Honest breeders will stand behind their products and either replace cattle that do not measure up to what they have said about them, or refund the money. It is well to consider that the fanciest horns, highest priced livestock, and the glib-tongued seller do not necessarily represent the best stock available for the money.

Purchase stock seen on the home farm—This is another way of saying, do not buy cull animals. Cattle purchased on the farm where they are produced can be compared to the rest of the herd and more easily eval-



Courtesy Soil Conservation Service

Fig. 2-10—Observe cattle on the home farm before purchasing. By this procedure type of feed, care and so on under which records were made can be observed and evaluated.

uated. Furthermore, records, and conditions under which records were made, can be closely observed. Sire and dam of cattle can often be seen on the home farm as well as offspring in the case of mature animals. While local auction yards represent one source of supply and sometimes good cattle can be purchased there, oftentimes breeders dispose of their cull cows at such sales because they are distant from home.

Test cattle for disease—Before buying a herd or even an individual animal be sure that tests have been made recently for tuberculosis, Bang's disease and mastitis. The federal government and many states have laws regarding tuberculosis and Bang's testing and vaccination, so it is not a difficult task to check on animals being considered for purchase. A veterinarian should be consulted in order to be certain. Whether dairymen are adding new breeding stock to their herds or the be-

ginner is just starting, it is a desirable practice to purchase only disease-free stock

Select good type cattle—Frequently records and pedigrees are not available, or the buyer seeking cattle is limited in funds so that he is forced to buy the animals in question by appearances alone. In such cases, it is profitable to select cattle according to "dairy type." While all dairymen do not agree as to what constitutes the best dairy type, Virginia Polytechnic Institute Bulletin 113 suggests the following points be considered

- 1 Dairy form
 - a Angular, wedge shaped body
 - b Natural lack of fleshiness
 - c Evidence of quality in hide and bone
- 2 Constitutional strength, health, and vigor
 - a Strength of body
 - b Style and erect posture when standing or walking
 - c Clear eyes and soft pliable hide
- 3 Body capacity
 - a Respiration—nostrils and chest cavity
 - b Digestion—muzzle and barrel
 - c. Reproduction—rump and loin
- 4 Milk secreting organs
 - a Size, shape, quality and attachments of udder
 - b Size, shape, and placement of teats
 - c Length, tortuousness, and size of veins
 - d Number and size of milk wells

Use the score card—A score card for dairy cows and one for dairy bulls were adopted by the Purebred Dairy Cattle Association and approved by the American Dairy Science Association. These score cards emphasize the important points to consider in selecting dairy cattle according to type. The score card on page 39 is the one recommended in selecting cows.

While it is recognized, selecting according to type has definite limitations. Circular 486, University of

DAIRY COW SCORE CARD

Units of type and breed characteristics used in the application of the terminology of the score card.

Based on Order of Observation		Perfect Score	Cow A	Cow B	Cow C	Cow D
1. GENERAL APPEARANCE <i>Attractive individually revealing vigor, femininity with a harmonious blending and correlation of parts. Impressive size and attractive carriage with a graceful walk.</i>		30				
BREED CHARACTERISTICS (see below)		13				
HEAD —medium in length, clean-cut, broad snout with large open nostrils, broad, strong jaw, full, bright eyes, forehead broad between the eyes and moderately dished, bridge of nose straight, ears medium size and alertly carried.						
SHOULDER BLADES set smoothly against chest wall and withers, forming neat junction with the body.						
BACK strong and appearing straight with vertebrae well defined.						
LOIN broad, strong and nearly level.						
RUMP long, wide, top-line level from loin to and including tail head.		10				
HIPS wide, approximately level laterally with back, free from excess tissue.						
THURLS wide apart.						
PIN BONES wide apart and slightly lower than hips, well defined.						
TAIL HEAD slightly above and neatly set between pin bones.						
TAIL long and tapering with neatly balanced switch.						
LEGS wide apart, squarely set, clean-cut and strong with fore legs straight.						
HIND LEGS nearly perpendicular from hock to pastern. When viewed from behind, legs wide apart and nearly straight. Bone, flat and sturdy, tendons well defined.		8				
PASTERN , of medium length, strong and springy. Hoofs closely moulded.						
FEET short and well rounded, with deep heel and level sole.						
2. DAIRY CHARACTER <i>Animation, angularity, general appearance, and freedom from excess tissue, giving due regard to period of lactation.</i>		20				
NECK long and lean, blending smoothly into shoulders and trunk, clean-cut throat and develop.						
WITHERS well defined and wedge-shaped with the dorsal processes of the vertebrae rising slightly above the shoulder blades.		20				
RIBS wide apart, rib bone wide, flat and long.						
FLANK deep, arched and refined.						
THIGHS curving to flat from the side, wide apart when viewed from the rear, providing sufficient room for the udder and its attachment.						
SKIN of medium thickness, loose, and pliable. Hair fine.						
3. BODY CAPACITY <i>Relatively large in proportion to size of animal, providing ample digestive capacity, strength and vigor.</i>		20				
BARREL deep, strongly supported, ribs wide apart and well sprung, depth and width tending to increase toward rear of barrel.		12				
HEART GIRTH large, resulting from long, well sprung fore ribs, wide chest floor between front legs, and fullness at the point of elbow.		8				
4. MAMMARY SYSTEM <i>A responsive, strongly attached, well carried udder of good quality, indicating heavy production and a long period of usefulness.</i>		30				
UDDER—CAPACITY and SHAPE , long, wide and of moderate depth. Extending well forward, strongly attached, reasonably level floor. Rear attachment, high and wide. Quarters evenly balanced and symmetrical.		25				
TEATS soft, pliable and similar. Well collapsed after milking.						
TEATS uniform, of convenient length and size, cylindrical in shape, free from obstructions, well apart and equally placed, pliable.						
MAMMARY VEINS long, tortuous, prominent and branching, with numerous large veins. Veins on udder numerous and clearly defined.		5				
TOTAL		100				

Courtesy - Purebred Dairy Cattle Ass'n.

Fig. 2-11—Dairy cow score card. A similar score card is also available for dairy bulls. Score cards are especially useful to beginners because they help them recognize the most important points.

Illinois, states it would be futile to continue breeding for high production year after year without giving proper attention to the selection of body form which would assure maintenance of that production.

Select females according to production—In order to make real progress in dairying, production records of individual cows must be considered. An experienced person is usually able to distinguish between cows capable of producing 150 pounds of fat annually and those producing 400 pounds or more. However, very few persons, if any, can distinguish between cows

capable of yielding 400 pounds of butterfat and those capable of producing 600 pounds or more, because both classes of cows, in all probability, possess similar external evidences of good dairy type. Therefore, cows can often be evaluated and selected for purchase or their continuance in the herd on a basis of their production record.

Standardize records—At first glance, records can often be misleading. For example, two cows of absolutely equal capabilities could make entirely different records if one had been milked 305 days, two times per day, and produced a calf, and the other cow milked 365 days, three or four times per day, and had not carried a calf during that time. Therefore, it is a desirable practice to consider all cows on a standardized record, generally 305 days, two times a day milked, and producing a calf within the twelve-month period since she freshened. This is accepted as a standard 305 day record.

Know they can produce a calf—If a dairy cow cannot produce a healthy calf yearly, she is generally considered a cull animal. Reliable breeders guarantee their cows to be capable of having a normal calf.

Select on type and production—Foundation animals should be selected or purchased with both of these factors receiving consideration. Breeders who expect to make real progress in breeding high quality dairy animals must select their replacement animals on this basis. As previous paragraphs have indicated, good dairy-type bodies are important in order for the animals to be strong, vigorous, healthy, and continue to produce year after year.

High production is obviously important, as this is why dairy livestock are kept. Seldom do animals yield high producing offspring if they as individuals are not high producers.

Consider pedigree—However, in order that these two

factors be correlated and some guarantee is obtained regarding the ability of an animal to yield top-notch calves, the pedigree or ancestral background of cattle must be known. If the pedigree of an animal shows that its immediate ancestors were excellent animals and for the most part produced good offspring, there is good reason to expect the animal in question will also yield good calves that will mature and continue high production.

The section on selecting a herd sire should be consulted for additional information on consideration of type, production, and pedigree. Grade and commercial dairymen seldom can select females on this basis and must rely on type and production alone. However, purebred producers, young people just starting to farm, or commercial producers who are starting a small registered herd along with their regular grade herd will find it a desirable practice to select their cows accordingly. Occasionally a valuable female, too old to be kept without special handling, can be purchased reasonably and serves as an excellent way of starting a small high-quality herd.

4. Selecting Desirable Heifers

This is an important factor in obtaining breeding stock because good quality heifers are often for sale reasonable, whereas cows good enough to be considered foundation animals are either not available or too high priced. In addition, buying heifers cuts down risks of disease. In general, the approved practices utilized in selecting cows, also pertain to heifers, except there is little evidence of mammary development and naturally no records of production available. Therefore, additional factors must be considered.

Consider size at given age—Select heifers that are well grown for their age and show evidence of health and vigor. Small and stunted heifers seldom develop



Fig. 2-12—Select desirable heifers. These young animals are well grown for their age and therefore should develop into profitable producers.

into good high-producing cows. Desirable weights will vary according to breed.

Choose heifers from proven ancestry—If heifers are sired by a bull proven for high production, it is the best possible assurance that they, too, will be excellent producers. Many times this is not possible because of the small number of proven sires. Nevertheless, pedigree of dam and sire should be studied carefully and selection based on those that most nearly approach an ideal pedigree. Refer to Section 5 on selecting a herd sire in order to evaluate a pedigree.

Watch for defects—Be certain heifers have four well-placed teats, good eyesight, and proper teeth. If registered, check for proper tattooing and color markings.

Purchase bred heifers—This indicates there is nothing wrong with the reproductive organs and very often has the added advantage of having been mated to an excellent bull.

5. Selecting a Desirable Herd Sire

The basic purpose for most people in keeping a dairy herd is to make money. The main sources of income are from the sale of dairy products and from the sale of cattle. When one considers that the great mass of dairy cows in the country produce around 180 pounds of butterfat yearly, while many good herds produce to 400 pounds or more yearly under almost identical conditions, it is easy to see the possibilities in increasing the productivity of most dairy cows. Since the herd sire in the long run will determine at least 50 per cent of the ability of the cattle within the herd, it is extremely desirable to select the proper herd sire.

Do not use scrub bulls—While it may be possible to achieve success in the dairy business by starting out with only average foundation cows, no advance can be made if the herd sire is selected in a similar fashion. Buying a scrub bull or getting one from the stockyards, a trucker or "bull jockey" will prove to be a most costly and unsatisfactory way of attempting to make progress in the dairy business.

Use all known factors in selecting herd sire—According to Michigan Extension Bulletin 276, attention should be given to: (I) progeny, (II) pedigree, (III) type.

Select sires according to progeny—The offspring of bulls is the best guide to what a sire will transmit in the way of type and production. A proved sire is one in D.H.I.A. that has a minimum of five unselected daughters with records and whose dams have records. Proof must include *all* daughters with records. The records are computed to a twice a day milking, 305 day mature equivalent basis. If a bull is proved to transmit high production, little regard need be given to his pedigree. Tables 1 and 2, USDA Misc. Pub. 547, illustrate the differences in proved bulls:

TABLE 1—A BULL PROVED HIGHLY CREDITABLE

Lakefield King Ventnor Fobes 732743

16 daughters	16 records	16085 lbs. milk	3.5%	590 lbs. BF.
14 daughters	16 records	17000 lbs. milk	3.5%	601 lbs. BF.
14 dams	39 records	14907 lbs. milk	3.4%	504 lbs. BF.
Diff. (6-8-7)		+2093 lbs. milk	+1%	+97 lbs. BF.

It must also be realized that a proved sire can be proved to transmit low production.

TABLE 2—A BULL PROVED UNDESIRABLE

Wisconsin Mystic Ormsby King 720871

14 daughters	20 records	7988 lbs. milk	3.3%	260 lbs. BF.
11 daughters	16 records	7904 lbs. milk	3.2%	254 lbs. BF.
11 dams	31 records	9011 lbs. milk	3.4%	310 lbs. BF.
Diff. (4-1-4)		-1107 lbs. milk	-.2%	-56 lbs. BF.

The figures 6-8-7 in Table 1, for example, indicate that six daughters exceeded their dams in milk production, eight exceeded their dams in per cent fat, and seven in pounds of butterfat.

Select according to pedigree—According to "Pedigree Analysis and Sire Selection" by Extension Service, University of California, the average cow in the United States could be made to increase her production 50-75 pounds of butterfat annually by proper feeding and management. The important fact, however, is that additional feed will bring very little increase. Further increase can be brought about only by consideration of ancestors or hereditary background. Therefore it is essential that approved practices be used in selecting foundation stock in order that they possess the hereditary factors for high milk and butterfat production.

Concentrate on sire selection—While each calf born receives one half of its inheritance from its dam, the fact remains that in one breeding season a bull transmits his hereditary characteristics to many offspring. In addition, the average herd is replaced with new animals every five years. Therefore, a sire properly selected controls the future production of the herd.

Learn to read pedigrees—A pedigree is the ancestral record of an animal and is generally presented in outline form.

Pedigree of King Happy Boy—Bred by John Doe, Centerville
Born Dec. 1, 1960

Happy Ladd

15 daughters.
No records yet
completed.

Boy Kind Dethrone

1st place, Jones Co. Fair

Smiling Lady, 2nd.

Queen Bess

420 lbs. 1st Lactation
305d 2x milk

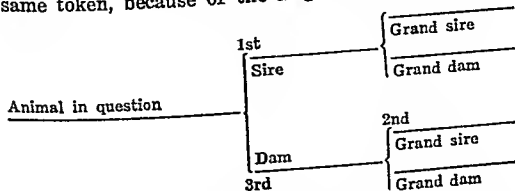
Royal Duke of Cloverdale

Sire of 8 A.R. daughters
Ave. M 18,561,
F 620.0 lbs. at 5 yrs.

Princess Babcock

Typical Pedigree—Outline Form

Find the important points in a pedigree—What are the most important locations to consider in studying the pedigree outline of an animal? According to Michigan Extension Bulletin 276, in most cases it is not necessary to give serious consideration to animals beyond the third generation, or the great grandparents. Therefore, the more immediate the ancestry of an animal in relationship to the animal under consideration, the greater its importance in the pedigree. By the same token, because of the large number of his off-



Figures 1, 2 and 3 represent the most important animals in a pedigree from a practical aspect.

spring through which he can be evaluated as compared to the dam, the most important animal in the pedigree is the sire. The graph illustrates the order of the most important animals to analyze in studying the pedigree of an animal.

The above pedigree outline indicates that if the sire can be found to transmit high production to his offspring, no consideration need be given to his background. However, if the dam is a good producer herself, there is no guarantee she can transmit this factor, due to the limited number of calves she will produce in her lifetime. Therefore, study the record of the dam's sire in order to see how pure she is hereditarily for desirable factors of dairy production. Then study the record of the dam.

Analyze the background of important ancestors—It is necessary to have an understanding of the conditions under which records are made in order to properly know the true ability of an animal. Following are some of the factors to know about each important ancestor.

a. What were the feeding conditions?—Records made using good commercial rations are best. Forced feeding of an animal will indicate an untrue value of an animal's ability to produce.

b. How often was the animal milked each day?—According to Michigan Extension Bulletin 276, three time milking will increase production an average of 15-20 per cent more than two time, and 4 time milking will be 5 per cent higher than 3 time, other conditions being equal.

c. How long was the cow milked?—Be sure figures are not quoted for 365 days or more. DHIA records are usually lactation records of 305 days in length on twice a day milking.

d. Convert all records to butterfat—Records that are given in butter will be approximately 20 per cent

higher than those reading butterfat. Butterfat records are accepted as standard.

e. Each cow should produce a healthy calf during the year in which her record was made.

f. Know which animal is under consideration—Frequently sale catalogs will describe a *relative* of the animal being advertised. Records must be made by the animal in question.

g. Prices paid are no proof of an animal's ability to produce desirable offspring. However, good animals are seldom low priced, but poor animals may frequently be high priced.

h. Get information on ALL offspring—Every sire or dam may have one or two exceptional calves. However, in order to prove he or she is genetically pure, all offspring must be studied and the typical or average given most consideration.

Reject animals with deformities—Milk production has been stressed most as it is of major importance.



Fig. 2-13—Selecting dairy cattle. Cattle should be selected on the home farm if possible so that feeding and other conditions can be observed.

However, animals with deformed udders and teats, poor attachments, should not be used as foundation animals because these characteristics are transmitted to their offspring as well as high or low milk production.

6. Know Where to Get Breed Information

Dairymen should know where they can find additional information on the breed in which they are interested as well as other phases of the dairy business.

Become acquainted with your breed association—The breed association can give desirable information on your breed as well as assist in advertising. Following are the addresses of important breed associations:

- The Ayrshire Breeders Association, Brandon, Vt.
David Gibson, Jr., Executive Secretary.
- The Brown Swiss Cattle Breeders Association,
Beloit, Wis. Fred S. Idtse, Secretary.
- American Dairy Science Association, 32 Ridgeway
Circle, White Plains, N. Y. F. Judkins, Secretary.
- National Dairy Council, 111 N. Canal St., Chicago
6, Illinois. Milton Hult, President.
- The American Guernsey Cattle Club, Peterborough,
New Hampshire. R. D. Stewart, Secretary.
- The Holstein-Friesian Association of America,
Brattleboro, Vt. Robt. H. Rumler, Secretary.
- American Milking Shorthorn Society, 313 S. Glenstone,
Springfield, Mo. W. E. Dixon, Secretary.
- The American Jersey Cattle Club, 1521 E. Broad
St., Columbus 5, Ohio. J. F. Cavanaugh, Secretary.
- The American Dairy Cattle Club, Interlaken, New
York. Theo. D. Day, President.
- The Purebred Dairy Cattle Association, P. O. 150,
Peterborough, New Hampshire. K. B. Musser,
Secretary.

The American Red Damsh Cattle Association,
Route 3, Marlette, Mich Harry Prowse, Secre-
tary.

Obtain help from government agencies—Many gov-
ernment agencies can assist the dairyman in his prob-
lems. Following are some of the most important ones
from which aid can be obtained.

U S. Dept. of Agriculture, Bureau of Dairy Indus-
try, Washington 25, D. C.

State Dept. of Agriculture, Dept of Animal In-
dustry, State Capitol (generally)

State college or university, Dept of Animal Hus-
bandry. Write c/o Dept of Animal Husbandry
or Extension Service

Farm Advisor or County Agent. One staff member
is often a specialist in dairying Generally each
county of each state has an Extension Service
located in one of the centrally located larger
towns

Teacher of Vocational Agriculture Located in the
rural high schools in most agricultural com-
munities

Learn from your neighbor—Oftentimes progressive
farmers in a community are the best source of infor-
mation and advice, particularly in regard to local con-
ditions and their effect on farming in that community

CHAPTER III

BUILDING UP THE DAIRY HERD

According to USDA Yearbook Separate No 1907, it would be possible to raise our national level of dairy production from 4,500 pounds of milk a year to 7,500 or more, and from 185 pounds of butterfat to at least 300. The ways and means of doing it are at hand, but progress is slow. Improvement can be made by utilizing up-to-date breeding practices so that cows have the necessary hereditary make-up for high production. The individual dairyman should take advantage of this opportunity and challenge, and by the use of approved practices, build his herd up to its full capacities.

Suggested List of Activities Which Involve Approved Practices

- 1 Selecting a desirable system of breeding
- 2 Building the future herd
- 3 Obtaining improved replacement stock
- 4 Obtaining use of superior sires
- 5 Breeding at the proper time
- 6 Keeping the proper ratio of bulls and cows
- 7 Keeping the breeding herd disease free
- 8 Culling undesirable animals
- 9 Testing the herd for butterfat production
- 10 Developing the herd to its fullest capacity

1 Selecting a Desirable System of Breeding

Decide on one system—There are several systems of breeding which may be followed. It is essential that the producer decide which one best suits his needs, background, and farming conditions, and stay with that system. Building up a dairy herd is a long time pro-

gram, so growers should not change their system of breeding frequently. Long time records are needed in order that they can evaluate their progress. Following are the breeding systems that may be used:

.Linebreeding is the most popular system with successful breeders as a means of obtaining uniform type and production in a dairy herd. Strictly speaking, linebreeding is a form of inbreeding, but refers to a type of mating with more or less distant relationships, such as cousins. Breeders generally mate back to one or two outstanding families. Successful herds often trace to one excellent sire or dam.

Inbreeding can obtain outstanding results—either good or bad. According to Technical Bulletin 927, USDA, on results of inbreeding grade Holstein-Friesian cattle, the number of generations of inbreeding had a more pronounced adverse effect than did the degree of inbreeding. In addition, the inbred calves were not as vigorous or resistant to calfhood infections as the calves that were not closely bred. However, a bull that carries no lethal factors in his germ plasm, or factors for malformed calves, may safely be bred back to his daughters. Continued inbreeding of whole herds is almost certain to be disastrous. It refers to matings such as daughter to sire, son to dam, or brother to sister. The present breeds of cattle, as well as many of the outstanding producers, have originated from such matings. However, while desirable qualities may be concentrated, abnormalities and undesirable traits may also result from inbreeding. Therefore, such a sharp tool as inbreeding should be used only by those who are experienced and well trained in animal genetics and breeding.

Outcrossing or the mating of unrelated or very distantly related animals of the same breed is a common system. If both sire and dam are superior type animals, this is a recommended system for the beginner. Some-

times it is advisable in order to introduce some needed characteristics into a herd.

Crossbreeding—In domestic animals, this refers to the mating of different breeds. Oftentimes this is done with other breeds of livestock than dairy cattle in order to combine desirable characteristics of both breeds, for example, combining the polled character with good milking qualities and increased vigor. The great disadvantage is that more than one separate herd must be kept because the desirable characteristics are combined in an animal *only* on the first cross. This system is not popular with successful dairymen at present; however, USDA at Beltsville, Maryland, states it is experimenting with crossbred animals for use under special farming conditions, as very hot climates. Occasionally a dairyman with only an average dairy herd who desires to produce some beef animals or change over his dairy business to beef will crossbreed his cows to a beef bull. Holstein to Aberdeen-Angus, for example, would produce all black, polled calves with fair beef conformation on the first mating.

Emphasize quality of individuals—It is not the system of breeding that is important but the quality of sires. Therefore, the dairyman should strive to utilize his best animals either male or female as foundation stock regardless of the system of breeding he plans to use.

2. Building the Future Herd

Plan a long-time breeding program—The successful dairy cattle breeder must have plenty of patience, as it takes a long time to breed an outstanding dairy herd. According to California State Polytechnic College "Rules of Thumb for Dairy Cattle," ten years is a very short period for such a program. While approved practices in feeding and management will raise production levels, most future progress will be made in improved

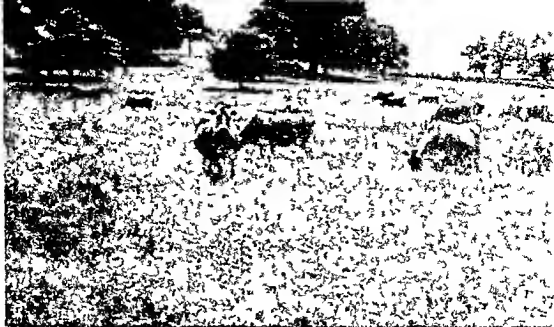


Fig 3-1—A fine herd like these cattle are the result of a long-time breeding program. At least ten years are required to develop an outstanding herd from ordinary cows.

breeding programs. It takes the production records of many offspring to determine whether or not an animal is capable of transmitting high production. Therefore, the producer must plan to improve his herd over a period of many years.

Start with the present herd—Progress in dairy breeding is best accomplished if breeders will inventory their present herd and determine exactly what is its present level of production. With this knowledge then, a breeding program can be outlined that will raise the production and type of the herd. It is relatively easy to outline a breeding program that would raise the production of a herd that averages 200 pounds of butterfat or less, whereas it is often difficult even to maintain a herd average of 400 pounds or over. High producing herds are seldom for sale and if they are offered are generally so expensive as to be out of reach of most dairymen. Therefore, producers who wish to plan for a superior herd in the future should first determine the status of their present herd and build up to the herd they desire ultimately to own. A herd of ordinary native cows can become a grade herd; grade herds can become high-grade herds, purebred herds can be improved

until they are capable of supplying foundation stock to other herds. Dairymen should first determine where their herd fits and build up accordingly.

Obtain replacements from a few of the best animals—Since the average herd loses 20 per cent of the milking stock each year, the entire herd is replaced almost every five years. It is important that this 20 per cent yearly replacement comes from the best cows in the herd. Successful dairymen search for excellent dams, and many fine herds have been built around one or two good brood cows.

3. Obtaining Improved Replacement Stock

Raise your own replacements—Considered from an economical standpoint as well as one of improving the herd, the most advantageous procedure is to raise your own replacements. The following factors can be accomplished best by obtaining most replacement stock from your own herd.

1. Diseases are more easily controlled and there is less danger of introducing infection into the herd.

2. Records are more easily obtainable and oftentimes more reliable and meaningful.

3. The worth of a sire can be determined by finding out how well his daughters are doing as compared to their dams.

4. Good replacement stock can be obtained at a more reasonable cost than trying to purchase them elsewhere.

5. Breeding can be delayed until heifers have reached the proper size, thus insuring their future development.

6. Replacement stock raised to breeding or calving time but not suitable for retaining in the present herd can be sold at no economic loss and often as an added source of income.

Maintain 20 per cent replacement—According to



Fig. 3-2—Raise your own replacements. These calves are disease free and healthy because they have been raised on the home farm.

University of California Circular 156, the maintenance of a herd of milking cows with satisfactory production requires the replacement of one out of five or 20 per cent of the average number of cows each year. Death losses are about two per cent and culling and disease account for another 18 per cent. The figure varies from year to year and herd to herd. Corral dairies such as those found around large cities will have a high replacement figure, usually from 30 to 35 per cent. Herds should raise annually at least three heifer calves for every 10 cows.

Raise all females to first calving—Calves born small, weak, or unhealthy are hard to raise, need more attention and a longer growing period. In addition, there is a higher mortality and they are therefore more costly. However, it is a desirable practice to raise all healthy, normal female calves to and through their first calving so production records can be obtained to determine

their worth and the ability of their parents. Oftentimes valuable animals are culled before their transmitting ability and true worth are determined.

Eliminate freemartins—A female twin to a male is termed a freemartin and is usually sterile. Therefore, it is a desirable practice to cull or dispose of such animals. All other twin calves may be raised with the assurance twinning has not impaired their breeding powers. Cornell University Bulletin 305 states that twins occur once in 80 births, and triplets once in 6,400.

Purchase only superior replacements—Increasing numbers of cattle in a herd does not necessarily increase total profit even though total amount of milk produced is greater than before. University of California Circular 156 states: "Any cow whose annual production does not pay direct feed and labor costs and whose disposal would not reduce income more than it reduces cost should be disposed of at once." Therefore, replacement stock added to the herd should be superior in type and production if a profit is to result. Oftentimes a limited number of excellent females introduced into the herd can serve as a basis for the future herd and hasten building up the future herd. According to University of Missouri, "Source Unit of Dairy Production," the following approved practices are suggested:

1. Purchase foundation stock from a reliable breeder.
2. Have replacements disease tested for TB, Mastitis, and Bang's.
3. Study production records and pedigree of individuals and ancestors before purchasing.

4. Obtaining Use of Superior Sires

Superior sires essential—While it is true that good herds have been built around the offspring of one or two excellent brood cows, this could not have been pos-

sible if superior sires were not also used. Furthermore, while each cow has only one calf per year, the herd sire is directly responsible for 50 per cent of the characteristics of every calf in the herd. Over a period of years, this effect is multiplied many times, especially if any kind of inbreeding program is used. Therefore, it is extremely important to select and use only superior sires.

Purchase best possible bull for each herd—The dairyman with a herd that will average 350 pounds or more of butterfat may have a much more difficult time maintaining that level of production than the one with a 200-pound herd average will have in increasing it with the help of well selected bulls. Therefore, it is extremely important that the greater the production capacity of the females making up the herd, the greater the study and consideration in the selection of a herd sire. It has been said that the inferior scrub bull is the most expensive bull regardless of what his owner paid for him, whereas the superior bull is never too high priced. A desirable goal is to purchase only bulls who show every indication of being able to transmit production that is higher than the herd in which they are to be used or, at least, able to maintain the production in herds of 350 pounds or higher.

Use a proved sire—As stated in Chapter II, a proved bull is one whose transmitting ability has been proven. Therefore, it is a desirable practice to use a proved bull whose transmitting ability is high enough to improve the production of the herd. This is not always possible, as proved sires are scarce and often eight to nine years old before their ability is known. Therefore, they are generally too high priced for the average dairyman to purchase. However, if accurate herd records are kept it is possible for dairymen to prove out their own bulls and use them accordingly. Often superior sires are uncovered within the dairyman's own herd by keeping

records, especially in relationship to the ability of that particular herd.

Consider using partially proved bulls—According to Michigan Extension Bulletin 276, bulls are often found which do not have a sufficient number of daughters with records to be proved or which have daughters out of untested dams. These sires may have equal or superior inheritance and transmitting ability to that of available proved sires, but such evidence is not yet complete. Because a bull is not entirely proved is no reason to eliminate him from consideration as a possible herd sire.

Consider raising your own herd sire—If a dairyman has a superior herd of cattle, there is no reason why he should not attempt to prove some bulls of his own breeding. Such bulls should be carefully selected as to pedigree, production, and health, and only top calves considered. Cost of raising these calves can sometimes be lowered by leasing them to other dairymen for a stipulated term under the condition that records be kept so the bulls can be proved.

Consider artificial breeding—According to Oklahoma A. and M. Circular 491, cooperative artificial insemination associations have tremendous possibilities for increasing the income and standard of living of dairy farmers through breeding of higher quality cows. The great advantage of artificial insemination is that it permits the extensive use of superior proved sires on a large number of cows thereby making it economically possible to obtain calves sired by the best possible bulls.

There are many other advantages, such as:

1. Eliminates danger of having a bull on the farm.
2. Provides small herd owners same bull service that only large herds could otherwise afford.
3. Disease is controlled, as only healthy bulls are used.



Fig 3-3—Artificial breeding of a cow. Artificial insemination of dairy cattle is becoming more popular each year. Many calves by a few superior sires are possible under this system.

4. Permits use of bulls that are beyond the reach economically of the average dairyman.

However, some dairymen still prefer the use of their own herd sire rather than a program of artificial insemination, mainly because of management reasons.

A program of artificial insemination is most successful when a large number of cattle are located in a small area. Oklahoma A. and M. Circular 491 states, "The more successful breeding circles have been ones that delayed operations until 1,000 or more cows are listed with the program."

A trained inseminator is essential to the success of the program.

Dairymen interested should contact their own breed association or their local county extension agent in order to locate the most available source for their herd.

5. Breeding at the Proper Time

Knowledge of reproduction essential—Many misconceptions exist regarding the reproduction of animals and probably no aspect of animal husbandry is less generally understood than the breeding of farm livestock. Because of the fact that lactation is so closely linked with reproduction, it becomes increasingly important with dairy cattle. In addition, an orderly flow of replacement stock must constantly be available. Therefore, it is necessary to use considerable care in following approved practices needed in reproduction.

freshen cows according to market demands—Cows differ from most farm animals whose reproductive cycle it is known in that they come in heat at regular intervals all the year round. If an even supply of milk is desired, calvings may be arranged to give a constant supply of milk throughout the year. On the other hand, market prices are higher at one time of the season than another, cows can be bred to freshen so their greatest lactating period is during periods of highest sales or greatest milk demand. Frequently most efficient use of labor can be effected by having the greatest number of cows fresh during lesser labor periods.

Freshen cows according to feed supply—According to Cornell Extension Bulletin 305, cows calving in the fall tend to produce more milk than those calving in the spring. The beneficial effect of spring grass tends to make itself felt at a time of low milk yield when more response may be made by the cow than when she is already at maximum yield, as is the case with spring calves. Time of year may vary a little depending on locality. An extreme example would be where "seasonal dairying" is practiced and all cows are "dried" up during a part of the year when feed is low and are bred to calve as close together as possible. Occasionally, in areas where manufacturing milk is the main product, dairymen will breed herds so all cows will freshen after

BUILDING UP THE DAIRY HERD

bad weather. If an adequate supply of year-round feed is developed on a farm, most dairymen breed cows that there is an even supply of milk throughout the year. It is a desirable practice to coordinate market demands and feed supply so as to produce the greatest profit for each herd.

Keep cows on schedule—Breed cows promptly 75 days after calving so they will calve once a year and still have a rest or dry period of 8 to 10 weeks. Too many dry cows are costly. A good general rule is to breed cows the second heat period after calving. With cows that are difficult to get with calf, many dairymen try breeding them as soon as they come in heat after calving in the hope that they will "catch" and become pregnant before too long a period has lapsed. If too long a period occurs before breeding, it becomes a management problem to determine when cows are in heat.

According to University of Illinois Circular 486, for highest yields most cows should freshen at 12-month intervals. High producing cows, however, may do better when they calve about every 14 months.

Delay breeding until proper size—The heifer comes in heat first from four to eight months of age, depending on her degree of growth and on the breed, but she should not be bred until she is about 18 months of age, more or less. Body weight, rather than age, should determine time to breed. Therefore, well grown, large heifers may be bred at a younger age than calves that have not been properly fed. The following age and weight schedule is suggested for breeding dairy heifers.

Age and Weight Schedule for Breeding Dairy Heifers

Breed	Age to Breed (months)	Normal Weight (pounds)
Holstein	19-21	715-774
Ayrshire	18-20	604-651
Guernsey	17-19	550-598
Jersey	16-18	533-572

Gestation table for cows

Gestation table for cows

(Courtesy UGDA, FB 1412)

Breed during heat period—The symptoms at the onset of heat are not marked, but the most reliable indications are restlessness, a tendency to bellow, and to mount and be mounted by other cows. Most dairymen say the best indication is when they will stand still while being ridden by other animals. A slight swelling of the vulva and a flow of mucus are also indications. A good way to pick out those cows which are in heat is to lead through the barn each morning a bull calf who will show his interest in certain cows by sniffing their rear quarters. These cows may then be tried with a bull to whom it is intended that they should be mated.

The duration of heat is variable, but generally is about 12 hours in heifers and 14 hours in cows. It tends to be shorter in winter, and more difficult to detect. In many commercial herds, it is considered a desirable practice to breed heifers first to the most promising



Fig. 3-4—Cow in heat. The animal that stands still and permits other animals to mount is the animal in heat. This is considered the most reliable symptom by many breeders.

sire, but in order to be certain they are pregnant, it is considered good management to let a young bull "run" with the heifer herd in order to insure all heifers being bred and on schedule their first lactation. Cows may be successfully bred any time during the heat period and a few hours afterward. A successful service by the bull can generally be assumed if the cow immediately after servicing has a decided hump in her back. However, this is not an indication conception has taken place.

Use breeding stocks for young heifers—Oftentimes large older sires are bred to young heifers. Under such conditions it is a desirable practice to use breeding racks or stocks as a safety precaution both for the heifer and the dairyman. Some dairymen prefer to use the breeding stock for all females.

Use artificial insemination for small females—Heifers and small females can easily and safely be bred to large heavy bulls by use of artificial insemination. This



Fig. 3-5—Breeding rack. Such a device permits mature bulls to be used on smaller animals without injury. However, many dairymen use a breeding rack for all services.

is particularly desirable if the older bull is sluggish and lazy and tends to have difficulty in keeping up with the heifers.

Pen cows in heat—A small pen near the barn is desirable to have available when cows come in heat. This is very handy when using artificial insemination as cows who appear to be in heat can be confined until they can be bred. It is important to have cows bred at the proper time and cows not confined are apt to go undetected later.

Breed more than once—Some breeders make it a practice to have cows serviced twice. Under this procedure cows are bred twice within 24 hours before they go out of heat. It will pay to consider using this desirable practice with most cows and especially with difficult breeders.

Be certain cows are pregnant—Much time and money can be lost if cows are not with calf when the dairyman desires them to be. Therefore, it is important that every effort be made to get them pregnant at the proper time. New York State Agricultural Experiment Station indicates that two services at six-hour intervals are more likely to impregnate the cow than a single service. However, with most cows one service is sufficient. No evidence of heat at the time the next heat period is due is generally considered to be sufficient evidence the cow is bred.

Watch for heat period—The interval between heat periods is usually three weeks, but individual cows may vary so that it may be as short as 16 days or as long as 24 days. Cornell Extension Bulletin 305 says that in a nonpregnant cow there is very little secretion between the heat periods. At the beginning of heat, the mucus is thin and watery. When the cow becomes pregnant, large amounts of this tenacious, almost rubber-like mucus are present.

Many dairymen can "bump" a cow and tell if she is with calf about 60 days more or less before parturition. Earlier than that it becomes increasingly difficult.



Fig 3-6—Determining if cow is pregnant. By proper training and experience dairymen can train themselves to determine pregnancy at an early date. The above operator feels via the rectum for the middle uterine artery where it passes over the pelvic bone. If the cow is pregnant the artery is greatly developed and a very definite pulse is obtained, so that pregnancy can be definitely determined at approximately 3 months. Additional training will enable some operators to determine pregnancy as early as 6 weeks by feeling the enlargement of the uterine horn caused by the development of the fetus.

However, veterinarians and others well trained can determine with some accuracy by "rectal bullotment" methods as early as 35 to 40 days.

Record each service—It is essential that a written record be kept every time a cow is bred. Date of service, name or number of bull, as well as any other pertinent information should be jotted down immediately.

6. Keeping the Proper Ratio of Bulls to Cows

Maintain quality of bull in keeping with herd—The kind of bull service needed depends greatly upon the kind of dairying. California Extension Circular 156 states that in corral dairies (near or in large cities) where no calves are saved, any potent bull is satisfactory and costs are mainly for maintenance. If heifer calves are saved, a good bull is essential. The larger the number of cows served by one bull, the lower is the cost per service.

Use young bulls less frequently—Yearling bulls may be used for services sparingly; about ten or more well-spaced services to mature cows may be allowed, the number depending on the growth and management of the bull.

Space services as evenly as possible—Whenever possible services should be spaced as evenly as possible. At two years of age, from 20 to 30 cows may be served, increasing gradually to 60 or 80 cows to be served in a year by mature bulls four years of age. If extra-heavy service is demanded, the bull should be given additional concentrates.

Buy bull service—According to California Extension Circular 156, it is economical to buy bull service for the small herd through artificial insemination, especially when service from superior sires is obtained. One association furnished the necessary semen for over 300 herds plus some outside sale. In other instances, one top bull produced over 500 calves in a year.

Grow out additional young bulls—Many times dairy-men depend upon one sire until he is very old or impotent. The loss of his services either through death or lack of fertility will result in a serious management problem as well as a dangerous interruption in the breeding program. Therefore, it is a desirable practice to grow out one or more young bulls depending on herd

size so as to have the right kind of bull available when the herd sire is gone.

Don't borrow bulls—Several diseases can be transmitted by bulls which are infected. Chief among these are vibrio fetus and trichomoniasis. Breeding difficulties and often abortion result by using infected bulls. Therefore, only healthy bulls known to be clean or semen from reputable breeding establishments should be used.

7. Keeping the Breeding Herd Disease Free

High percentage calf crop essential—One of the main factors of success in the dairy business is that each cow produce a normal, healthy calf every year. This is true because of the need for replacements, but especially so in view of the fact that high yearly milk production is so closely linked with normal reproduction.

Supply adequate nutrition—Strictly speaking, a disease condition exists when malnutrition is present. According to Cornell Extension Bulletin 305, the relation between feeding and fertility is very important. The best condition for efficient reproduction is an animal that is thrifty, not too fat, and not too thin. The semi-starved female does not ripen eggs as she should. Instead, they degenerate or are produced irregularly. Permanent damage may be done to ovaries by an insufficient diet. Vitamin A and proper proteins are considered essential factors in supplying adequate nutrition. A condition of extreme fatness is as dangerous to the ovaries as is semi-starvation.

Provide sufficient exercise—Exercise cannot be too strongly stressed. It promotes good health and reproductive efficiency. The bull is most apt to have too little exercise, particularly during the winter. Most dairy-men consider it an approved practice to provide long runways, access to large pastures occasionally, fre-

quent walks with an attendant, or some other equally practical method of getting animals exercised

Test for Bang's disease—Cows should be blood tested for Bang's disease or contagious abortion. Regularity of testing would depend upon whether or not the disease is suspected of being present. If the herd or part of the herd is infected, it should be tested every six months and culling or other management steps taken until the trouble is eradicated. If infection is widespread, young calves are often tested as well as mature animals. Any competent veterinarian can do the testing.

Vaccinate calves for Bang's—Regular calfhood vaccination is the most desirable prevention against contagious abortion. Calves should be vaccinated when



Fig. 37—Vaccinate calves to protect them from diseases like Bang's. It is important to vaccinate at the proper time and age of livestock.

they are from six to eight months of age by a recommended strain of vaccine. Legislation has made the service free to dairymen in many parts of the country. However, producers should take care to see that no heifers are missed and have the vaccination done by a competent person if free service is not available.

Watch for other breeding diseases—By far the largest single cause of wastage in dairy herds is due to reproductive troubles, either complete sterility or delayed breeding. "Chronic bullers" or cows that accept the bull at any time yet do not become pregnant are one type. *Vibrio fetus* and trichomoniasis also can be very expensive to an individual herd if present, even if they are not as widespread as other diseases. It is a desirable practice to consult a veterinarian concerning such infections so as to eliminate the immediate trouble and prevent further spread.

Cull shy breeders—Most dairymen persevere too long in their attempts to overcome shy breeding. Any cow that must be bred four times or more should be carefully examined for disease or other trouble, or possibly culled. Bad breeders are kept too long, thus increasing the losses to the owners and increasing the liability of infection to the rest of the herd. Never use the best bulls on shy breeders, as there is danger of communicating an infection to the bull and hence to the rest of the herd. According to recent investigations at Cornell University, cows with no obvious signs of disease which come in heat fairly readily and yet do not conceive, may do so if they are dried off and rested. However, only exceptional cows should be given the benefit of such treatment, as it is generally more economical to dispose of the animal and replace her with a healthy heifer.

Use a beef bull—Under certain conditions it may be desirable to use a beef bull. If only replacements are to be kept from the best females then inferior females who are in the herd only till proper herd size is reached

may be bred to a beef bull. Small heifers that should be bred in order to come fresh at proper times may be bred to beef bulls as beef calves are generally fairly small. Calves from this source may prove to be a profitable sideline.

Ignore curious beliefs—Probably no field of biology has as many myths associated with it as does that part dealing with reproduction. While there may be some scientific background for a few of them, other economic factors far outweigh any such proposed advantages. One example is that of telegony which states that the influence of one sire persists in the offspring of a different sire used at a later date. Research has failed to find any truth in this or many similar beliefs.

8. Culling Undesirable Animals

Strict culling essential—Culling must be practical and gradual since it is important to maintain the herd at a size that best fits available feed, labor, and facilities. It can be used as a means of keeping the size of herd at its best number through the removal of poor animals as better ones become available.

Cull according to the herd—Consideration must be given to the quality of the entire herd when culling an individual animal. Thus it would be a desirable practice to cull a 400 pound cow in a herd averaging 500 to 600 pounds, whereas the same animal would be considered outstanding in a herd averaging 250 pounds yearly.

Cull for production—The removal of low producing cows from a herd increases the average production of the remaining herd. Any cow that does not produce equal to or more than direct feed and labor costs, should be culled unless the feed would go to waste or labor could not be put into other efforts. Even then, retaining such an animal should be considered a temporary practice. Testing all cows in the herd for butterfat is an important part of the culling program.

Consider the age of cows—According to University of Illinois Circular 486, cows as a rule show an increase in milk and butterfat until they are about six years old, and at eight years they normally begin to show a decline. Therefore, it is desirable practice strongly to consider disposing of any cows after eight years of age unless they are above average producers and free from breeding troubles.

Cull on long-time production—Frequently animals make exceptionally good records as heifers, but fail to increase or even maintain their production on subsequent lactations. Dairymen are prone to keep such animals because of their past reputation. Therefore, the long-time record of the cows and their persistence in lactation should be carefully evaluated whenever good replacements are available.

Cull on other factors—Unless cows are extremely good producers, factors other than production and pedigree should be given considerable thought. Practical dairymen believe one or more of the following conditions as sufficient reason to cull an animal:

1. Cow is unusually hard milker.
2. Kicks or has other vices.
3. Refuses to fit into management scheme and must always be given extra labor.
4. Difficult to detect when in heat.
5. Unusually mean cows (bulls are never to be trusted).
6. Chronic bloaters.
7. Any other factor which materially raises costs of labor or production.

Learn to select and judge cattle—Type should always be given some consideration in culling animals. The ability to judge and select animals comes mainly through practice and experience. Therefore, it is a de-

sirable experience to learn the factors necessary for successful judging of dairy cattle.

One of the important uses of a knowledge of selection is used in classifying animals. Type Classification is a program of the breed associations in which an official type rating is placed on animals in a herd. Michigan Extension Bulletin 276 lists the following:

Class	Abbreviation	Ayrshire (score)	Brown Swiss (score)	Holstein (score)	Jersey (score)
Excellent	E	90-100	90-100	90-100	90-100
Very Good	V. G.	85-90	85-90	85-90	85-90
Good Plus	G. P.	80-85	80-85	80-85	80-85
Good	G	75-80	70-80	70-80	75-80
Fair	F	70-75	60-70	60-70	70-75
Poor	P	Below 70	Below 60	Below 60	Below 70

Scores for a herd or daughters of a bull may be averaged to indicate the type for a group of animals.

9. Testing the Herd for Butterfat Production

Testing essential—The Babcock test which accurately measures the amount of butterfat produced by each cow is an essential part of the process of building up the dairy herd. Equally important is an exact measurement of the amount of milk produced by each cow in the herd. These two measurements constitute one of the greatest tools to use in selecting and evaluating the animals in a dairy herd.

Learn to test milk—Anyone can learn to test milk or cream successfully—even if he has never done it before or isn't trained in laboratory work. While most dairy-men will not actually do the work of testing their own milk, knowledge of the correct procedure will greatly improve the dependability of their records.

Follow testing directions exactly—All state experiment stations publish bulletins on testing milk and cream. The result will be dependable if:

1. You have clean equipment.

Fig. 3-8—Testing milk for butterfat is an important part of the breeding and selection program. In the future other methods of testing and components of milk other than butterfat may be the basis of culling.

2. You get a sample that is typical.
3. You follow directions (from any experiment station bulletin, e.g., California Circular 340) in detail.
4. Precision is important. Results will be no more precise than your operation.

University of Missouri Source Unit 3 suggests the following approved practices:

1. Test milk and cream to determine the amount of butterfat each cow is producing and use as a basis for selection.
2. Obtain representative sample of entire milking by mixing thoroughly before taking sample.
3. Follow steps carefully of the Babcock test to secure accurate and reliable test results.
4. Dispose of milk acid mixture immediately after reading and recording the test and wash all equipment thoroughly.

5. Heat frozen milk or cream to 90 degrees F., obtain sample and test by usual procedure.

It is extremely important that *all* cows in the herd be regularly tested each month rather than an occasional test on selected individuals.

Participate in an improvement association—Records are apt to be more reliable and accurate if producers join an improvement club and cooperate with other members. Additional benefit is gained through the association advertising, as well as receiving and exchanging ideas between producers. Many improvement associations exist. Michigan Extension Bulletin 276 lists:

1. Herd Improvement Registry, or H.I.R., is an official plan of the dairy breed association for keeping production records on all cows with certain minor exceptions within a herd. Its main purposes are for herd and breed improvement as well as advertising.

2. The Dairy Herd Improvement Association, or D.H.I.A., is an unofficial plan of keeping production records on all cows in a grade or purebred herd. Its main function is to secure information for herd improvement.

Dairymen should consult their local county agent for the plan operating in their locality and most suited to their conditions.

Make advanced records—Individual cows, superior in quality, have an opportunity to gain recognition through the various breed associations. Advanced Registry, or A.R., within the Ayrshire, Guernsey, and Holstein breeds; Record of Production, or R.P., within the Brown Swiss, and Register of Merit, or R.M., within the Jersey breed are terms used to indicate official records made on individual cows selected within a herd.

Standardize records—Records used as a basis for selection can be very misleading. Therefore, it is a desirable practice to standardize all records when com-

paring cows so that records have a common meaning. Suggested approved practices to standardize records are:

1. Convert all records to *mature equivalent* (M.E.)
 - a. Michigan Extension Bulletin 276 states:
 - 2 yr. old record considered to be 70 per cent of M.E.
 - 3 yr. old record considered to be 80 per cent of M.E.
 - 4 yr. old record considered to be 90 per cent of M.E.
 - b. Convert records to two time daily milking.
 - c. Convert records to 305 days lactation.
2. All cows considered should produce a calf in the 12-month period.
3. Similar conditions of feed and care should exist.

10. Developing the Herd to Its Fullest Capacity

Each herd must operate at the most efficient peak for that particular herd if greatest return is to be realized. Poor management and under feeding result in lost dollars on a herd capable of higher production. However, extra good care and overfeeding can also produce a lower net profit if the cows within the herd do not have the ability to produce even though gross income may be higher because of extra feeding. In order to properly select individuals and build up the herd, it is important for cows to be given a good chance to develop and produce.

Feed to full capacity of cows—Comparisons of individual cows cannot be made and culling properly accomplished unless each cow receives enough feed to demonstrate her ability. This is especially important on high producing individuals, as they show up best on feed available after maintenance requirements are met.

Develop helpers properly—Stunted calves seldom de-

velop into good cows regardless of the amount of feed and care they receive later in life. Sires cannot be correctly evaluated if their daughters are not allowed to mature properly. Therefore, proper nutrition and care are extremely important to heifers that eventually will form the future herd.

Breed at proper age—To sacrifice size of animal for early calving is a serious mistake. The undersized heifer, after freshening for the first time, is limited in her ability to produce milk because the stimulation to grow is still strong. Heifers that are accidentally bred too soon should have their calves removed from them shortly after calving and dried up, thus allowing them to resume growth.

Raise production on the basis of herd average—Greatest returns are possible only when every cow in the herd is an economic asset. Therefore, it is a desirable practice to test *every* cow, cull *all* unworthy animals, and feed the entire herd adequately. Notoriety gained by having a few outstanding animals seldom lasts long. Any dependable herd average considers dry cows, nonbreeders, and low producers. One of the most dependable indications of a profitable herd is a high herd average.

CHAPTER IV

HANDLING THE DAIRY HERD

Success in dairying depends largely on the proper care and efficient management of the herd. Because profitable cows must be comfortable cows, all dairy operations must be planned with due regard to the comfort of the animals. Unless the dairyman is well acquainted with approved practices, he is likely to make many costly mistakes.

Suggested List of Activities Which Involve Approved Practices

1. Caring for the cow at freshening.
2. Caring for the newborn calf.
3. Training the heifer to milk.
4. Milking the dairy cow.
5. Drying up the dairy cow.
6. Caring for the dry cow.
7. Handling the dairy heifer.
8. Raising the young bull.
9. Handling dairy cattle safely.
10. Providing shade and comfort.
11. Preventing diseases.

1. Caring for the Cow at Freshening

Condition cow before calving—According to Iowa State Bulletin P106, the first essential to getting a good calf is to feed the cow well during gestation. Having access to good pasture, hay or silage solves most of the problems of feeding dry cows. If they are in poor condition, four to eight pounds of concentrates should be fed daily. The same ration used for milking cows is satisfactory.

Prevent mechanical injuries—In handling cows that are heavy with calf, care should be taken to prevent them from being injured by slipping on stable floors or ice, by crowding through doorways, or by mounting cows that are in heat. Separate cattle that are in heat from those heavy with calf.

Observe carefully for freshening date—Usually a dairy cow will carry her calf a period of 283 days (gestation period). However, they may range from 270 to 290 days after breeding. If accurate breeding records have been kept, the date can be calculated to within one to ten days.

Keep cow as quiet as possible—Small children and dogs are apt to excite her at this time. However, it is best not to change surroundings or routine if possible, but keep her in familiar surroundings. According to Bulletin 113, Virginia Polytechnic Institute, if weather is bad about ten days before the cow is to calve, she should be placed in a maternity or box stall (10'x12') which has been thoroughly cleaned and disinfected beforehand. During summer months and in mild climates, most dairymen prefer to let cows calve in the open on a well-drained pasture near enough to the farmstead to get some observation. A small well-grassed pasture free from trash or manure and close to the barn makes a good calving place in the summer. (See chapter on feeding.)

Feed a laxative ration—Ground oats mixed with wheat bran and linseed meal are good concentrate feeds to use before calving. However, any feed changes should be made gradually and several days before actual expected calving time. If excellent pasture and hay are available, many dairymen feed little or no concentrates to their cows at this time. If a laxative ration is fed, she should be left on it for two or three days after calving and gradually returned to her milk producing diet.

Care for the udder—It is normal for the udder to become large and swollen just before calving. The vast majority of healthy udders undergo such a development with little or no trouble. Controversy exists as to whether or not the udder should be milked out before calving. If the udder is milked prior to calving, it is a good idea to freeze the colostrum milk so as to have it available for the newborn calf later. Special precautions should be exercised to see that old nails, loose boards, etc., do not cut and injure the swollen udder. In extreme cases, a veterinarian should be promptly consulted.

Observe the cow at calving — Be with the cow at calving to assist if necessary. However, do not annoy or pester her. After the first sign of calving, if all conditions are normal, it is best to leave the cow entirely alone until immediately after calving. According to Iowa Bulletin P106, front feet of the calf should



Fig. 4-1—Cow with her newborn calf in clean, dry, desirable surroundings. During dry warm weather pasture calving is a good practice provided they can be observed from time to time.

appear first, then the nose. Any abnormality in presentation requires immediate attention by a competent person to correct the position of the calf so it can be delivered. If the weather is very cold, it is a desirable practice to give her warm water to drink.

Dispose of afterbirth—When the afterbirth (placenta) has been discharged, it should be burned or deeply buried. If the placenta is not discharged within 48 hours, a competent veterinarian should be called to examine the cow.

Guard against milk fever—There is always danger that high producing cows will develop milk fever at calving. The dairyman should be alert for any symptoms of the disease and should be equipped so he can treat the cow promptly. However, if available, it is a desirable practice to call a veterinarian. According to Farmers Bulletin 1470, it is best not to draw all the milk from the udder for a day or two after calving, as it may help prevent milk fever.

Resume feeding gradually—Give the cow as much roughage as she will eat provided she is accustomed to a liberal allowance of roughage, but feed concentrates sparingly at first and then increase gradually. Take at least three weeks to get the cow up to full feed.

2. Caring for the Newborn Calf

Make certain calf is breathing—According to Iowa State Bulletin P106, immediately after the calf is born, make sure that all mucus is removed from the nose and mouth. If the calf does not start to breathe, artificial respiration should be used by alternately compressing and relaxing the chest walls with the hands.

Be sure the calf gets first milk—The calf should remain with its mother for forty-eight hours to get the full benefit of the colostrum or "first" milk. This substance protects the calf against disease and has a laxative effect.

Remove calf from mother early—The sooner the calf is taken away from the cow, the less the cow will fret over its loss, although the calf may thrive better if left with the mother for two or three days, especially if it is weak or may suffer from cold. While not a general practice, some dairymen keep one or two nurse cows who will let more than one calf nurse even though they are not her own. This is an aid in managing dairy calves.

Disinfect navel—The new-born calf is very susceptible to disease germs. Apply tincture of iodine to the navel at birth and dust with boric acid powder. If a long cord is attached to the navel, snip it off about two inches from the body before applying iodine. The navel cord should not be tied but allowed to drain.

Dehorn early—Dehorn calves at three days of age or not later than one or two weeks old. Apply caustic potash or good commercial preparations to the horn buttons. Clip the hair from the area around the horn button and apply the preparation to the button. A little



Fig. 4-2—Disinfecting navel of newborn calf. If the farm has a bad history of disease it is very important to perform this practice.



Fig. 4-3—Dehorning young calf with caustic potash. Other preparations are satisfactory; the important thing is to do it early, before the calf is ten days old.

grease around the clipped area will prevent the preparation from running. Calves should be kept out of rain for several days and away from other calves for a few hours after treatment. New collodion preparations harden quickly and are unaffected by rain.

Mark for identification—Before removing from the dam, the calf should be given some mark of identification. Any one of many methods may be used, such as ear tagging or a tag fastened to a strap around the neck. Animals to be registered must be sketched, photographed, or tattooed according to regulations of the breed association.

The most permanent identification is tattooing using black, indelible ink. Tattooing dark-skinned breeds, like Holsteins, is seldom visible even though red ink is used.

Use the nurse cow—While not practical in all herds, many dairymen use nurse cows in raising their calves. The method may be more costly, but less labor is involved as well as less digestive disturbances and infec-



Fig. 4-4—Tattooing ear of calf This is the most permanent method known and works particularly well on light skinned breeds.

tion. Hard milkers, low testers who let any calves suck, make good nurse cows. Once calves are past the critical stage, other newborn calves may take their place.

Freeze colostrum—If a cow has too much “first milk”



Fig 4-5—A healthy calf in a clean pen. Freedom from drafts, cleanliness, and proper sanitation are the key to healthy calves.

for her calf the extra milk containing the colostrum may be frozen and stored for use later.

3. Training the Heifer to Milk

Getting heifers broken to milk correctly is an important factor in making the job of milking less irksome.

Train heifers early—Teach her to lead at an early age. Kindness in care of the heifer will make her easier to handle when she enters the milking herd. However, making "pets" is not necessarily to be encouraged, as they often are so fearless of people they become a problem.

House springing heifers with milking herd—Heifers housed or stalled with the milking herd a month or so before freshening, easily work into the routine of the other cattle so that nothing strange is encountered at freshening.

Milk her carefully—The development of a nervous condition at this time may cause the heifer to form the habit of kicking or holding up her milk. After freshening, it is a desirable practice to milk her carefully and quietly so she will not get excited. Ropes or hobbles may have to be used, but should be a last resort.

Whenever a heifer does tend to kick excessively and requires some restraining device, it is desirable to proceed as follows: Obtain a light $\frac{3}{8}$ -inch cord several feet long and form a lasso. This is placed around the heifer's legs just above the hocks with the end of the cord held high by another person or looped up over a rafter. Unless the animal begins to kick, the loop should be very loose as it will induce kicking if too tight. When the animal struggles a light pull on the cord generally subdues her as she cannot kick far when her legs are held together.



Fig. 4-6—A small rope loosely held above the hocks will often prevent heifers from kicking, or should they start, a slight pull will quickly subdue them. Oftentimes the end can be over a rafter, eliminating the necessity of a helper.

4. Milking the Dairy Cow

Pay attention to management—In no type of farming does the operator handle his livestock as much as that of the dairy business. This is true mainly because of the constant task of milking, which accounts for approximately 25 per cent of total labor cost. Many ideas exist regarding proper methods of handling cattle before and during milking. One factor to be remembered is that the cow is a creature of habit and can be trained to fit almost any pattern. The important factor to consider is not what pattern is selected, but that once chosen it should be adhered to without much change.

Provide a pre-milking activity—Dairy cows that are gotten up to run into the milking barn immediately tend to dirty the barn a great deal with manure. It is a desirable practice to utilize a holding pen or corral so that cows will stand around awhile before being let



Fig. 4-7—Clipping the udder. Regular clipping helps keep the udder clean and allows easy washing.

into the milking shed. This activity tends to promote bowel movement and gives them a chance to defecate before they come into the barn.

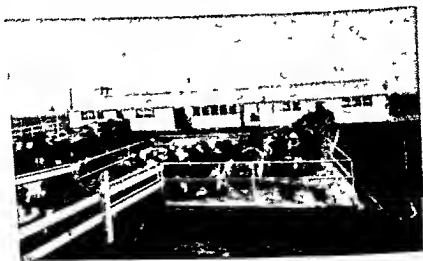


Fig. 4-8—Holding pen. Cows penned in such a manner just prior to milking tend to leave the floor of the barn clean.

Milk cows regularly—An ideal arrangement might be to have cows milked at the same hour each day and by the same person. However, it must be remembered that cows respond best to what they are accustomed to. According to Farmers Bulletin 1470, average to good cows may be milked rather irregularly with no marked effect upon production provided other operations, particularly feeding, are carried on at regular intervals. Therefore, an approved practice is to do dairying operations as regularly as possible, but occasional deviations are not serious.

Obtain good milkers—In spite of the general belief that a cow will produce more if always milked by the same person, the practice in many of the larger dairies is to milk the cows as they come. This serves to equalize the work and if the cows are acquainted with all the milkers they will probably give as much or nearly as much as if they had been milked by the same person. Some milkers are naturally more efficient than others, so it is desirable to have a person who is a good, natural milker and understands livestock do the milking.

Milk at the same interval—The "giving down" of milk is caused by releasing the milk into the cisterns and teats where it can be drawn rather than by actual secretion at the time. The greater the pressure in the udder the less the secretion of milk. According to Farmers Bulletin 1470, it is believed that one can safely estimate an increase of 20 per cent by milking three times a day instead of twice, and 35 per cent by milking four times. Whether it will pay to milk a cow more than twice a day depends upon the kind of cows and the dairyman. Low producing cows would seldom pay to milk more than twice a day.

Prepare the udder—Just before milking, the cow's udder should be washed and dried so as to insure sanitation. Slightly warm water is best, depending upon

the climate. Don't stimulate cows too soon before milking.

Milk cows rapidly and completely—More information on milking is found in the chapter on Care and Handling of Milking Equipment. According to Farmers Bulletin 1407, eight cows an hour would be classed as good hand milking. Stripping should not be continued so long that the value of milk obtained fails to cover the value of time spent, as some milk left in the udder does no harm nor causes the cow to dry off rapidly.



Fig. 4-9—Washing cows' udders preparatory to milking. Look closely to see the sprinklers imbedded in the concrete. In this fashion udders are washed from beneath and all dust removed in an easy efficient manner.

With milking machines, rapid milking is preferable not only because of the time saved, but because harmful results might come from long continued suction. Machines should not be left on longer than five minutes even though considerable stripping must be done.

5. Drying Up the Dairy Cow

At one time drying off a persistent milker was accomplished with some difficulty because it was thought necessary to treat and feed the cow so she would be producing only a few pounds of milk when milking stopped completely.

Stop milking—According to Farmers Bulletin 1470, cows giving as much as twenty pounds daily will not be injured if milking is discontinued abruptly. Even high producers can often be dried up by this procedure. These cows should be turned into a good pasture and observed occasionally.

Withhold feed—All cows cannot be successfully dried up by simply stopping milking. Cows producing more than twenty pounds of milk daily are best dried off by withholding some of the feed until production has been reduced to approximately twenty pounds per day. Then milking can be reduced to once a day or every other day. The milk is gradually reabsorbed as lactation ceases. Heavy, thick milk at this time is no cause for alarm.

6. Caring for the Dry Cow

Too often cows are overlooked and improperly cared for during the dry period. It is a serious mistake to let the cow "hustle" for herself on an inadequate ration. Many dairymen claim a cow's next production record is determined by her care when dry.

Allow ample dry time—The length of the dry period required depends upon the quantity of milk the cow has been producing and on her condition or fleshiness. Iowa State Bulletin P106 states that the cow needs six to eight weeks dry period with good feed to rebuild body stores. USDA Farmers Bulletin 1470 suggests thirty to sixty days dry period for cows well fed and in good flesh at the time of drying up, the shorter period being for low producers.

Provide sufficient food—Cows should not be "hog" fat just before calving, but rations should be such that they are gaining in weight. According to Farmers Bulletin 1470, a dry cow on good green pasture will get all the nutrients she needs. However, if she is in poor condition, four to eight pounds of concentrates should be fed daily to get her to normal weight. The feed during the dry period should contain plenty of protein and minerals, especially those rich in calcium and phosphorous.

Prepare cows for lactation period while dry—Get cows gentled down while dry by handling them in stanchions and grooming. This is also a good time to attempt to clear up chronic ailments, such as mastitis, as well as making sure they are free of parasites, warts, etc.

7. Handling the Dairy Heifer

Feeding essential—No amount of management and care will be of much avail unless the heifer receives sufficient nutrients to properly develop into a mature animal. It is essential that she be fed economically and proper use made of home-grown feeds and many waste roughages, as no income is received from growing heifers until they calve. The chapters on Feeding and on Raising Dairy Calves discuss approved practices to be used in selecting proper rations. However, it is well to remember that young stock will do well on just good quality pasture or hay with silage after they are eight months old and up until they are heavy springing heifers.

Keep heifers thrifty and growing—The heifer should be growthy and in good flesh at all times, especially by calving time, otherwise she may not give as much milk as she should after calving, or grow at a satisfactory rate during her first milking period. On the other hand,



Fig. 4-10—Provide comfortable quarters for growing heifers. They need protection from wind and rain more than from cold.

heifers should not be excessively fat. This is especially true with Jerseys and Guernseys.

Provide comfortable quarters—During warm weather or in mild climates, good pastures are excellent quarters and no other shelter is needed. Many dairymen believe rolling or hilly pasture which provides proper drainage with a few trees for shade is the ideal quarters for growing stock. In bad weather heifers should have dry, well-bedded, ventilated stalls with a suitable place for exercise. These can be provided by a pen in a barn or an outside shed open to the south with access to a yard. It is not a wise investment to construct expensive housing quarters for heifers. Pure water and salt should always be available.

Separate young stock—Young bulls after three or four months of age should not run with the heifer calves. In addition, as far as practical, heifers of about the same age should be kept together and separated from those older or younger. Older heifers sometimes cripple smaller ones when the younger ones are in heat.

Delay breeding—In order to obtain sufficient growth, breeding should be delayed until the proper time. (See Chapter III.)

Register calves early—It is desirable to register calves worthy of registration at or before six months of age. Waiting longer than this often results in increased fees. The breed association concerned can give complete details as to registration procedure for that particular breed. Consult Chapter II for locations of various breed associations.

Train animals continually—Well managed heifers are a pleasure to work with and save labor when calving time approaches and they must be milked. It is easier to teach young stock to lead before weaning age. Oftentimes tying them for brief periods and leading them to water will teach them to do so with a minimum of effort. Run springing heifers with the milk cows for a month or so before calving so as to get them used to the routine and being handled. It is always desirable to treat the heifers with firm kindness.

8. Raising the Young Bull

Unless cows can be bred through an artificial insemination program, the purchase of superior quality bulls is very expensive. Therefore, it is practical to raise sires from young bulls which have been carefully selected.

Feed well—As a general rule, bull calves may be raised and fed exactly like heifers. However, according to Farmers Bulletin 1723, he should receive more feed than the heifer after six months of age due to his more rapid growth rate and larger size.

Separate early—Bulls and heifers may be raised together as calves until about four months of age. After that the young bulls should be separated from the heifers but always do better if several of them are

raised together. A young steer could be used in order to keep the young bull company. Corrals and pens should be in good condition in order to prevent the bulls from breaking out or injuring themselves.

Provide exercise—The importance of exercise is often underestimated. Many bulls after their value has been proved are found to be sterile or slow breeding, which may be due largely to close confinement and lack of activity. University of Missouri Source Unit No. 3 says to provide a well built open shed facing south with an adjoining pen for exercise (a stall 12'x16' is sufficient space per bull). Fence pen with strong material placing posts close together. Posts should be at least 5½ feet above ground and very sturdy (6'x6' with the part below surface treated to prevent rot is a good size). Corrals should be long and narrow, about 12'x100' or thereabouts. Many devices have been used to provide exercise, such as suspending an empty keg or block of wood, yoking bulls like oxen and working them, to elaborate bull exercisers which lead bulls on a circular pathway. Two or more bulls turned together will play and get considerable exercise provided they are dehorned so as to not injure each other. Young bulls may be turned in with older bulls to exercise as they are active enough to keep away from danger.

Dehorn bulls—Calves that are to be raised for breeding service should be dehorned as calves. Use caustic potash or a similar treatment. (See Chapter V.) Some breeders do not follow this practice because of the possibility of lowering the sales value for buyers who may want to show them. However, more and more dairy-men are following the practice of dehorning all dairy bulls. The horns of mature bulls or young bulls whose horns are well developed should be removed by a skilled operator, preferably a veterinarian.

Watch the feet closely—Bulls kept in close quarters frequently develop long hoofs. In addition to being un-



Fig 4 11—Note the button that has been treated with caustic so as to remove the horns on this young bull. This method is safe and contributes to a bull's appearance when mature.

sightly, this may become so painful to the animals that they cannot stand or walk squarely. The hoofs should be trimmed or they will break off and disfigure the animal. Hoofs of young animals often can be trimmed with a long-handled chisel or pruning shears while the ani-

mal is standing on hard dirt or a plank floor. If more must be trimmed away, stocks are desirable in which to hold the bull so the hoofs can be trimmed with a pincer and rasp. If stocks are unavailable, the animal may be "cast" and the feet trimmed while he is held down.

Ring at eight months—The ring is a safeguard in handling, and every bull should have one in his nose regardless if he is gentle and easy to handle. According to Farmers Bulletin 1412, a copper ring two to two and one-fourth inches in diameter should be placed in his nose when he is between eight months and a year old. However, it should be replaced with a larger and stronger gun-metal ring at two years of age. Unruly bulls occasionally have two rings. In order to ring the animal, tie the bull's head fast so he cannot jerk. Self piercing bull rings may be used or a trocar with canula can be employed to puncture the septum first. The bull should never be tied by the ring.

Limit service—According to California Extension Circular 107, well-grown bulls may be used once or twice a week beginning at ten or eleven months of age, and the number of services increased after twelve to thirteen months of age. Most bulls over two years of age can breed fifty to sixty cows per year.

Teach to lead—Bulls should be gentled similarly to heifers; however they should never be trusted, especially as they get older. The bull should be trained to lead while still a calf, first with a halter and later with a staff attached to the ring in his nose. They should not be pastured on public highways or other places where they can break away and cause damage.

9. Handling Dairy Cattle Safely

Proper handling essential—Dairy cattle often must be resold and shipped. In addition, dairy cattle come in contact with people more often than any other class of livestock. Bulls must receive special attention in par-

ticular. Therefore, it is exceedingly important to use proper procedures in handling cattle safely so that neither humans nor animals will be injured or financial loss result.

Shipping

Limit feed—Cattle being shipped should not be fed heavily; however, sudden changes in rations should also be avoided if possible. Native grass or non-legume hay is best. Water should be supplied at all times.

Provide secure footing—Adequate loading chutes, proper racks, etc., should be provided so animals or people will not become injured while loading. Cattle are afraid to put their weight on shaky objects even though they may easily support them. Cleats or other devices should be provided on ramps to prevent skidding.

Sand floors—Truck beds and concrete ramps should have dry sand sprinkled over them to prevent slipping. In warm weather, the sand may be wet down to keep livestock cool and in cold weather warmth can be provided by covering the sand with six or eight inches of straw.

Load carefully—Special loading pens make handling for shipment an easy operation. However, the cattle should be moved slowly and "at their speed" rather than being rushed. Move all cattle at once unless stock is balted. Never attempt to single out individual cows as they often refuse to leave the herd. Electric prodgers or other devices should be used as a last resort.

Ship stock when dry—According to Farmers Bulletin 1470, dry cows or bred heifers ship better than do milking stock and seldom need attention unless the distance is great. Bulls should be shipped individually, and if long distances are involved, they should be crated.

Farmers Bulletin 1412 recommends bulls be shipped by freight in a boxcar if long distances are involved.



Fig. 4-12—A very desirable cattle loading chute. The ramp is made of concrete steps which contribute to secure footing and safe, easy, loading. The steps are extended so the operator can follow the animal up the ramp.

Instructions for feeding and watering should be written on cardboard and tacked on the crate. Young animals may be turned loose unless there are only a few. In such cases, they can be penned in one end. Cows are best tied to one end or the other.

Guard against hardships—Shipping fever is always a risk when transporting livestock. Use of antibiotics is not recommended by all agencies, but local veterinarians can decide which practice to follow. However, any hardship tends to lower vitality and makes livestock subject to infections which they normally would resist. According to USDA Leaflet 38, overcrowding in cars or trailers should be avoided. When unloaded for feed, water, and rest, the cattle should have plenty of time to become well rested. Five hours is the minimum rest allowed under the twenty-eight hour law, and eight hours is better. Dairy stock moved short distances by trailer or motor truck need not worry about rest, but drivers should concentrate on steady, easy driving and see that no animal gets down. Sudden stops or fast turns can prove disastrous. It is of utmost importance that cattle not be subjected to undue hardships during shipping.

Insure against hazard—Most commercial trucking companies as well as the railroad insure all cargoes, even livestock, as a matter of course. Individual dairy-men can do so by obtaining a special policy for a particular trip. Ordinary animals moved locally probably would not be worth the time and expense to do so unless very valuable animals were involved. Farmers Bulletin 1412 states it may be advisable to insure bulls against all hazards for a period of from thirty to sixty days so that the insurance covers a period during shipment and enough time to get accustomed to new conditions.

Safety Devices

Use strong fences—Under no condition place a bull in a yard or pasture that does not have a substantial fence. After a bull has once broken through, it is harder to keep him in. A mound of earth in the center keeps the bull away from the fences because he pre-

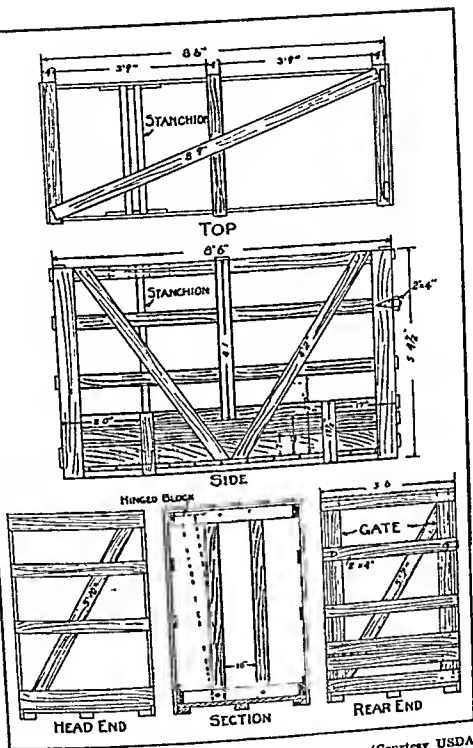


Fig. 4-13—Plan of shipping crate. The size can be changed to suit the size of the animal.

(Courtesy USDA)

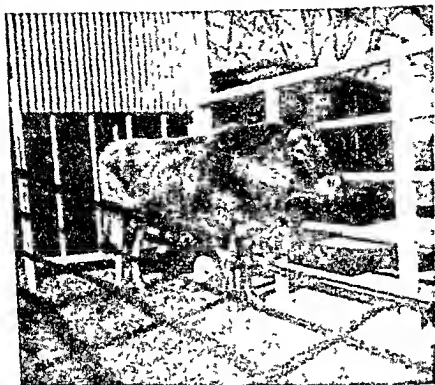


Fig 4-14—A strong, safe bull pen. Every dairy should have such a pen

fers to be high where he can see better. Mounds are especially desirable if the fences are solid.

Provide man escapes—Narrow openings, ten or twelve inches wide, between two stout posts serve as a ready means of escape for the human, but are close enough together to prevent large animals from entering. Not only do such exits provide a safety factor in a bull pen, but often save many useless steps.

Utilize gates—Loading chutes, bull pens, and other cattle handling devices can make excellent use of strong gates, well hung in strategic locations.

According to Farmers Bulletin 1412, a gate and breeding rack can be so placed in the yard that it is unnecessary to go into the yard where the bull is kept. The bull stall or shed should also be separated from the corral by a sliding gate that can be raised or lowered

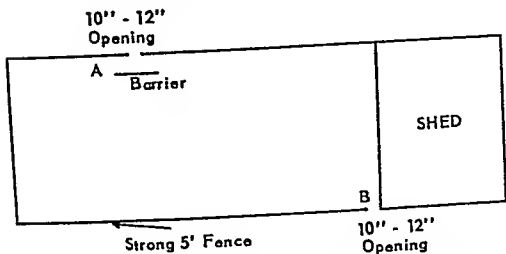


Fig. 4-15—Floor plan of bull pen. Strong "man escapes" in either location (A or B) give a safe rapid exit for humans.

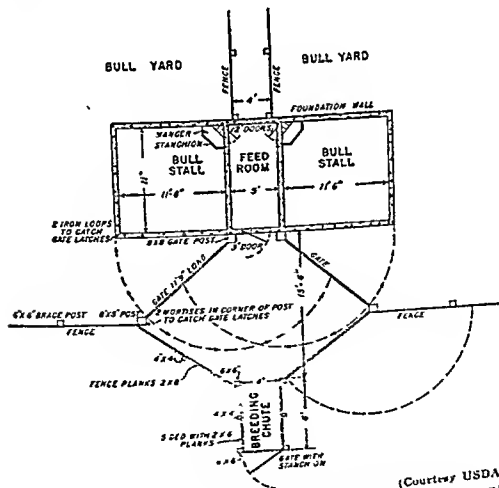


Fig. 4-16—Floor plan for the shed, showing arrangement of breeding chute and system of gates used for the two bulls.

(Courtesy USDA)

by a rope from the outside thus making it possible to pen the animal one place or another at will. It is desirable to construct all breeding lanes long and narrow as an additional safety feature.

10. Providing Shade and Comfort

If cattle are to be kept in good condition they must be protected against the elements. Nevertheless, the outdoors is their natural habitat and oftentimes labor and expense are expended needlessly in an attempt to protect animals when they are really quite comfortable outdoors. Sudden changes, such as from warm barn to cold outside, should be avoided. Normally the body warmth of animals in a barn is sufficient heat to guard against cold.

Avoid drafts—In the severe winter weather of North Dakota, cows have been found to thrive in open sheds where little protection was afforded against low temperatures, but where they were kept dry and out of the wind. Rolling, hilly pastures where cattle can rest on the lee side are desirable quarters. Temperatures are seldom low enough to cause calves any discomfort, but structures should be free from drafts yet well ventilated.

Protect against sun—The summer temperatures appear to be more trying to dairy cattle than are winter temperatures. Average temperatures exceeding 85° F. for more than forty-eight hours were found to increase body temperature and lower milk production. During hot weather, cows often refuse to graze except when the sun is down or low. Trees in pastures form excellent barriers against high summer heat. If trees are not available, open sheds should be provided against the direct rays of the sun.

Supply adequate water—Animals cannot be comfortable unless sufficient water is available at all times. Animals can live longer without solid food than with-

out water. The quantity of water depends on the dairy cow's size, amount of milk produced, air temperature, and dry feed in the ration. It may vary from two to twenty gallons or more a day. Water should be clean and fresh. A tank heater can be used to provide warm water in winter.

Eliminate flies—Everyone is well acquainted with the unsanitary, bothersome annoyance caused by flies. There are many species and all are particularly abundant around most dairies during warm weather. Not only do large numbers of flies lower production and spread disease, but they are a continual source of discomfort to operators. Thanks to many of the newer chemical insect killers, flies can now be eliminated for all practical purposes. The following suggestions will greatly reduce fly populations:

1. Practice cleanliness. Clean up all spilt milk and other dairy products immediately. Wash off floors of milking parlors and all equipment as soon as milking is completed.

2. Protect manure. Liquid manure should go into a covered drain or storage tank. Solid material should be placed in a protected shed. Screened sheds for manure and manure spreaders are common on up-to-date farms.

3. Use recommended chemical sprays. Recent improvements make it almost impossible to recommend any one product. However, the chemical should not affect public health, flavor the milk, nor harm the cattle. Local county agents can advise on sprays and materials best to use in each area. Spreader-sticker compounds show promise of making each application last much longer and this greatly reduces the number of sprayings.

Allow freedom—While it is possible to raise animals completely penned, general health, appetite, and appearance may be improved by letting animals out of

close confinement. Whenever possible, allow calves freedom and exercise. Give calves of all ages access to fresh air and sunshine when weather conditions permit.

11. Preventing Diseases

The chapter on Controlling Diseases and Parasites enumerates the many approved practices that can be used in preventing and controlling the many ailments of dairy cattle. However, there are several serious troubles of dairy cattle that are often a result of not using approved practices in handling the dairy. Following are several common maladies that can frequently be eliminated by proper handling of the dairy herd.

Bloat

According to University of California Extension Bulletin 662, bloat is the result of gases being formed in the stomach of the cow faster than they are expelled by belching. When the walls of the stomach lining are stimulated by coarse fibers, belching results. Young alfalfa, clover, or any soft feeds are more likely to cause bloat. Some animals appear to be more susceptible than others.

Keep cattle filled—Before being turned onto pasture, it is advisable to give the animals a good fill of other hay so they will not be too hungry and eat too rapidly and too much. Thereafter, keep them on pasture continuously enough so they will not become hungry and overeat.

Provide some coarse feed—Dry hay or roughage will induce belching and lower the chances of bloat occurring. According to Farmers Bulletin 1470 provide either some dry roughage in the pasture which the cattle will eat at will or give them access to a pasture in which grasses rather than legumes predominate.

Allow pastures to mature—Allowing pastures to reach a fair degree of maturity before turning the

cattle on them, appears a less dangerous practice than pasturing when very immature. Not only is danger of bloat reduced, but pastures stand up better and in the long run will yield more nutrients than when pastured too early.

Provide adequate minerals—Most dairymen feel that cattle are less apt to bloat if an adequate diet is supplied. When part of the diet is lacking, it tends to give animals a perverted appetite. Therefore, it is a desired practice to have salt free choice at all times and to provide other minerals that may be deficient in the area.

Mastitis

Mastitis is any inflammation of the udder. It can be the result of freshening, injury, or a result of disease-producing bacteria. Mastitis that is the result of pathological organisms is particularly important to the economy of milk production. According to scientists in the Pennsylvania Agricultural Experiment Station, quarters of an udder infected with streptococci produced 22 per cent less butterfat than streptococci-free quarters. According to Michigan Extension Folder F125, cows can get mastitis through bruises or other injuries to the udder. Therefore, it is very desirable to handle cows properly so that they will not become infected with mastitis organisms as a result of improper handling.

Raise your own replacements—One of the commonest methods of introducing mastitis into the herd is by purchase of infected cows. The best source of replacement cows in order of preference is:

- a. Home-raised heifers.
- b. Purchase of bred heifers.
- c. Purchase of mature milking cows. Test all replacement cows before purchase or buy them subject to test and isolate them.

Prevent injuries—All injuries, especially those occurring in the udder and teats must be properly treated



Fig. 4-17—Clean stalls and gutters are essential to producing clean milk and preventing disease. Plenty of water under pressure is necessary in order to do a satisfactory job of cleaning.

to prevent subsequent infection. High door sills, improper stalls, loose boards, and doors that can bruise the udder tissue should be repaired or renovated so as to eliminate the danger.

Use sanitary milking procedures—Cows should be arranged into healthy, suspicious and infected groups and milked in that order so as to prevent infected cows from spreading the disease. Complete milking procedure is outlined in the chapter on Milking Machines. Teats should be handled with dry hands so as to prevent cracking and chapping.

Practice sanitation—Stalls and other quarters should be thoroughly cleaned, especially where milking takes place. Plenty of clean bedding should be on the floor if the cows are to lie down, so as to lessen the danger of teat injuries. Keep the barn dry and permit plenty of sunshine to enter. It is extremely desirable to practice the utmost sanitation in caring for the milking equipment.

CHAPTER V

RAISING THE DAIRY CALF

Feeding and Raising the Dairy Calf

No dairyman will make much of a success unless he continues to build up his dairy herd from year to year. It is next to impossible to build up a herd by buying mature cows, or even by buying heifers. The only dependable way is to raise heifer calves from the best cows in the herd and from good purebred bulls. Raising calves and building up a herd is a difficult and important job and we shall devote an entire chapter to the subject.

The cost of feed and labor is so high that it doesn't pay to raise a calf unless it shows promise of developing into a high producing cow. Generally that means it will pay to save calves only from the better producing cows, and ones that have good health and vigor. A weak calf has a poor chance if it gets a disease.

Suggested Activities Which Involve Approved Practices

1. Caring for the cow before calving.
2. Attention to the cow at calving.
3. Attention to the young calf.
4. Care during the first month.
5. Cleaning the calf pens.
6. Feeding the calf.
7. Feeding plans.
8. Weaning the calf.
9. Supplying vitamins.
10. Providing low cost feed.
11. Removing extra teats.
12. Dehorning calves.

13. Providing dry well-ventilated quarters.
14. Common calf ailments.
15. Checking gain of heifers.

1. Caring for Cow Before Calving

Successful calf raising begins with the right feeding and care of the pregnant cow.

The greatest growth of the unborn calf, with the heaviest demands on the cow, takes place during the last few weeks before birth. Because of this, it is well to *give the cow a dry period of six to eight weeks*, and to feed her properly during this rest period.

During the grazing season, good pastures provide the nutrients, vitamins and minerals needed by the dry cow for health and thrift. Thin cows should receive additional concentrates.

During the stable feeding period, high quality hay and silage as well as *concentrates* (grains and protein feeds) are needed to nourish the unborn calf and to build up the cow for coming lactation period (Wis. Cir. 439)

Pen cow at calving time—A dairy barn should have at least one maternity pen for calving, for every eight or nine cows in the herd. The pen should be at least 10x12 feet in dimensions and properly located to avoid exposure to adverse weather. When a cow is judged to be within 24 hours of freshening she should be removed to this pen, it having been put in proper condition. All manure and old bedding should be removed. The walls and floor should be scraped and scrubbed with a washing powder solution or a hot 1 per cent lye solution made with a 12-ounce can of lye in 10 gallons of water. If a washing powder is used for scrubbing, the pen should then be disinfected with a suitable creosol or chlorine solution and then well bedded. (Mich. Bull. 105)

2. Attention at Calving Time

The birth of a calf is a critical period for it as well as for the cow, though there is little occasion for anxiety if the calf is full term and the cow is in proper condition. When the dairyman has concluded the calf will come within an hour or two he should plan to make frequent observations, but it is not necessary nor advisable to keep the cow under constant view. Usually a cow will not need assistance in calving, and it is better not to enter her stall unnecessarily. If delivery is not made shortly after labor commences some special difficulty may exist and the possible cause should be ascertained. If the presentation is abnormal the service of a veterinarian is needed.

3. Attention to the Young Calf

When the calf is born the first act of the dairyman is to see that it starts breathing. Mucus or phlegm is removed from the mouth and nose. Blowing in a calf's mouth can dislodge some of the phlegm not reached with a finger. If the calf lies motionless and fails to emit a sound some method must be used to induce respiration. Taking hold of the calf's rear legs and suddenly lifting it clear of the floor with the head down or slapping its chest may produce the desired effect. Sometimes the calf is dashed with cold water; alternate compression and relaxation of the chest—artificial respiration—may be used successfully.

As soon as the calf breathes, the navel should be disinfected as a precaution against disease. The substance from the adhering end of the navel cord is squeezed out and the navel painted with iodine. The use of powdered alum helps to dry the parts. A cow should be given all the warm water she wishes to drink as soon as she delivers the calf.

The next step for the attendant is to clean the pen



Fig. 5-1—A beautiful pasture like this is a good place for cows to calve during mild weather. Most cows will calve unaided and should not be excited.

of all expelled membranes and soiled bedding. Usually a cow will immediately lick her calf which helps to dry and clean it. If the cow fails to do this, the calf should be rubbed vigorously with a towel or burlap.

Wash the cow's udder—Before a calf stands to nurse, the cow's udder and teats should be washed with a chlorine solution. This is another precaution to avoid infection. Normally, a calf will stand and suck within 15 to 30 minutes. If it fails to do this, assistance should be given. The colostrum, or first milk secreted, invigorates the calf and has the desired laxative effect. Within an hour or so after the calf receives the first colostrum it should have evacuated its bowels of the

first feces, or meconium, which is the yellowish material accumulated in the alimentary tract of the fetus. Careful examination of the bedding is desirable to ascertain if this material has been eliminated. If this is not passed within the allotted hour or two, an enema of one-half teaspoonful of soda or salt in a quart of warm water should be given.

4. Give Extra Care First Month

The calf that's worth raising is worth raising well. To grow into a profitable cow, even the best calf needs to be given a good start. Calves set back early in life may never fully recover. Hence the importance of proper feed and care, *especially during the first month*, cannot be overemphasized.

It is important, too, that the calf be kept growing. Satisfactory growth also means vigor and strength necessary for protection against calf diseases and other illness.

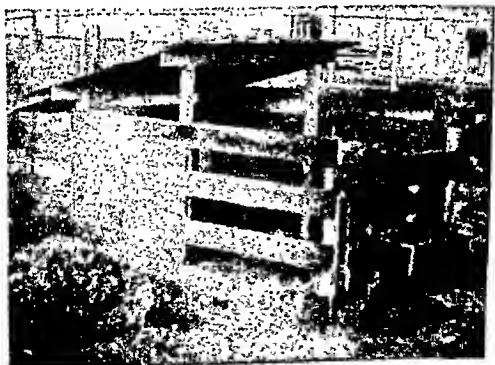


Fig. 5-2—Portable calf pen. This pen can easily be moved to new ground. The feed box lifts out for easy entrance of calves.

It is usual practice to leave the calf in the pen with the cow for two or three days. The calf thus obtains the colostrum and nurses frequently. Some dairymen leave the calf with the cow until the milk is suitable for human use, or for four or five days. The longer use of the colostrum and longer period of nursing are beneficial, but the cow may give too much milk for the calf to consume. Also after such a long period both the cow and calf are more disturbed when finally separated.

While the calf is still with her, the cow must be milked at least twice a day. This allows the dairyman to detect a quarter the calf may have neglected. He can also partly control the amount of milk the calf receives. If too much milk is left in the udder it delays the disappearance of the congestion and may lead to difficulties. However, as a precaution, good cows should not be milked entirely dry for the first two or three days. Leaving some milk in the udder tends to prevent milk fever.

5. Clean Calf Pens Are a "Must"

Those of you who are on dairy farms know that it is not easy to keep a calf pen clean. Yet the trouble it takes will pay out. In fact you are plain asking for trouble if you don't keep them clean. Even if you don't have a modern dairy barn you can have a clean barn and you can provide a good place for the young calves. It's more important to keep a calf pen clean than it is to keep it warm.

Maintain uniform temperature—As long as calves are healthy, fairly low temperatures are not serious, though it is preferred that freezing be avoided. An effort to maintain too high a temperature in colder weather often is made by eliminating all ventilation. This results in dampness, which is bad. If calf pens are in the main part of the barn they will usually be kept warm enough by the animal heat from the cows. In

more elaborate barns, artificial heat is sometimes furnished the calves, but it has been the experience at Michigan State College that such heating is often injurious: A calf thus handled suffers greatly with even the slightest exposures, which are difficult to avoid. Open doors will allow drafts which may be dangerous to the health of the calves.

Calf quarters also need attention from the standpoint of summer conditions. A lack of proper cleanliness may be more serious in summer than in winter because of excessive putrefaction and the fly nuisance. It is important that calves be protected from flies as a matter of health as well as comfort. Keeping the pens and premises clean and darkening of windows will help control flies. Use fly sprays.

Use mesh wire for calf pens—In recent years many dairymen have installed in the calf pens mesh wire, slats or steel grating to elevate the calves three or four inches off the cold floor. A special calf mat, of expanded steel grating, has been designed for this and can be purchased in sections ready to be laid on the floor. Some dairymen have built their own calf mats using a framework of 4 x 4's with heavy screen. In small pens, the entire floor is covered; in larger pens the mat is laid in a corner or in half the pen. Bedding is placed on the mat; the urine drains through, thus keeping the bedding drier. Calves like the warmer, drier bed.

Don't overcrowd—For best results the young calf should have an individual pen until it is about 4 weeks old. A calf at this age requires about 18 square feet of floor space; hence the pen should be at least $3\frac{1}{2}$ x 5 feet in dimensions. The individual pen permits individual attention to a calf; it also prevents calves from sucking one another. If a calf becomes sick there is less likelihood that it will infect other calves. Steel pens are desirable from the standpoint of convenience and



Fig. 5-3—A little meal placed on the calf's mouth will encourage it to eat.

cleanliness, but many farmers have built their own pens from scrap lumber or other material they may have available.

If calves are confined together, stanchions or ties are necessary to secure them when milk is fed. The calves should be kept tied after the milk is fed until they eat some grain and are thus curbed in their desire to suck. A calf two or three months old should have 30 to 35 square feet of floor space. Crowding of too many calves in a given space makes it difficult to keep the pen clean and dry. (Adopted from Michigan Extension Bulletin 105.)

6. Feeding the Young Calf

Proper feeding is fully as important as clean and comfortable quarters. Wisconsin Circular No. 439 calls attention to several important points in calf feeding.

Feed newborn calf promptly—Be sure that the calf gets a good feed of the cow's first milk within 15 minutes after birth.

Why is the cow's "first milk" so important to the new-

born calf? For one thing, the first, or *colostrum* milk, acts as a laxative and cleans out the calf's digestive tract. The colostrum milk contains antibodies that help the new born calf fight off diseases and infections. It is also an excellent source of the nutrients needed to get the calf off to a good start.

Weak calves may need help—Most calves will nurse in an hour after birth. But the weak calf may need some help—like holding it up and, if needed, directing a stream of milk into its mouth, to get it started nursing. Or colostrum can be fed from a bottle or nipple pail.

Usually the new calf may be left with the cow two or three days, or until the milk is salable. After this, the calf should be taught to drink from an open pail, or on a nipple pail. However, many dairymen prefer to start feeding the calf right off because it is easier to get them to drink before they have nursed their mother.

Teach the calf to drink—Teaching the calf to drink out of a pail is no easy job. There are a number of contrivances on the market that are made to help in teaching the calf to drink. Some of them are good but there is always a danger of them becoming dirty and contaminated. This may cause digestive disturbances of the calves. Remember, they must be kept clean!

The first step in teaching a calf to drink is let him go without food for some hours after he has been taken away from the mother. Let him work up an appetite! In teaching him his first lesson, a good way is to back him into the corner of the pen, put the fingers of one hand into his mouth and gradually pull his muzzle down into the milk. If he has been nursing his mother, you know he has been getting his meals by lifting his head up, not lowering it, so he may not agree with your idea of pushing his head down! But if you are strong enough you'll win. He'll soon learn to do



Fig 5-4—Place capsules on top of the tongue and well back in the mouth of the calf so the pills will be swallowed.

it your way. Anyway here's luck to you on your first try!

7. Feeding Plans

Don't overfeed—From the time a calf is removed from a cow at two or three days of age until it is a month old is a period of importance. If it can be brought through this period successfully its chances of development are materially improved. Whole milk is essential.

Because milk with a high fat percentage is more likely to cause scours, a low-testing cow can often be used to advantage. Where this is not feasible the richer milk can well be diluted by using one part of warm water to two parts of milk.

The most frequent error in handling calves is over-feeding—The young calf usually does better if he is kept on the hungry side. A good rule is to feed the calf only 8 to 10 pounds of milk daily per 100 pounds of body weight. This means 6 to 10 pounds (three to five quarts) daily during the first week. Generally, the calf is fed twice each day; however, some dairymen prefer to feed three times a day until the calf gets a good start. For calves that are small or weak at birth, this extra trouble may be worthwhile.

Don't make sudden changes in feeding—In shifting from whole milk to skim milk or milk substitutes, it is best to make the change gradually over a period of one to two weeks. First, substitute a small amount of the new feed for an equal amount of the whole milk. Increase the amount of the new feed each day (reducing the amount of milk equally) until the complete change has been made. Milk fed to calves should be warm—about body temperature (100 degrees F.). Cold milk may upset young calves.

Right feeding builds health—According to Wis. Cir. 439, to grow well, a calf must be healthy. It must eat

enough. Its feed must supply: (1) enough *energy*, (2) enough *good-quality protein*, (3) *mineral matter* for growth of bone, muscle, other tissues and (4) *vitamins* necessary for the calf's growth and health.

The diet must also be bulky and succulent enough for good digestion. And to make sure the calf eats enough, the ration must taste good.

All common feeds supply energy, but those high in fats and carbohydrates (starches and sugars) are the main sources.

Protein is highly important because a large part of the calf's body is made up of protein. It must also be *good-quality protein*. For this reason, milk (or other proteins from animal sources) are usually included in rations for young calves.

Feed milk according to weight—The first three or four weeks of the calf's life is a critical period and milk is very important at this time. The old thumb rule, "Feed one pound of milk per day for each 10 to 12 pounds of body weight" is a good rule to follow.

More milk can be fed if it is offered three or four times daily. The calf's appetite and condition should serve as a guide in feeding.

Milk is so important to the calf's growth, it is well worth the time taken to weigh or measure the amounts fed.

Feed daily—*Holstein and Brown Swiss* calves of good size: 9 to 10 lbs. milk daily for first few days.

Jerseys, Guernseys and Ayrshires: four to eight lbs. milk daily for first week depending on size.

Increase amount of milk as calf grows—for all breeds.

The "limited whole milk" plan—When whole milk sells at a high price on the market, there is often a tendency to cut down on the milk fed to calves—even to a point where they do not receive enough milk for normal growth. It is always well to remember that

calves will not make good gains even on the best dry ration until they eat it in sufficient amounts to supply their needs for growth and development.

A helpful feeding plan—While it may not produce greatest growth, the milk-feeding plan outlined here will produce normal gains if followed carefully. It offers a method of taking full advantage of a limited amount of whole milk—300 to 400 pounds per calf. The weight and appetite of the calf should govern the exact amount of milk fed.

For best results, weigh or measure the milk and feed according to the schedule shown below.

Pounds of Milk to Feed Daily

Age of calf	Pounds of milk to feed daily	
	Holsteins and Brown Swiss	Guernseys Jerseys Ayrshires
1-3 days	Suckles cow; or is hand-fed colostrum	
3-7 days	9 to 10 pounds	4 to 8 pounds
2nd week	10 to 12 pounds	5 to 8 pounds
3rd week	10 to 12 pounds	6 to 9 pounds
4th week	8 to 10 pounds	6 to 9 pounds
5th week	6 to 8 pounds	6 to 7 pounds
6th week	4 to 6 pounds	5 pounds
7th week	4 pounds	4 pounds
8th week	{ No milk after 8th week if eating grain well	4 pounds
9th week		3 pounds
10th week		2 pounds
		{ No milk after 10th week if eating grain well

Dry calf starter—When limited whole milk or milk replacers are fed, it is necessary for the calf to eat dry feed by the second week. Feed each calf all of the starter it will eat up to 4 pounds daily. When the calf is 4 months old the starter may be replaced by a growing ration. (Discussed later in chapter.)

The starter is used as a substitute for part of the milk; it must be palatable, low in fiber, and high in protein.

Coarse mixture preferred—One of the major factors

in palatability is texture. Coarse grinding or crushing is preferred for farm grains used in calf starters. Whole oats and cracked corn may be used satisfactorily. Some starters on the market are pelleted. Experiments show no particular advantage for pelleting over coarse grinding. Individuals may have a preference, but either coarse meals, pellets or a mixture is satisfactory for most calves.

Rich in protein and energy—Calf starters contain 18 to 20 per cent protein. Also many contain some animal protein such as dried milk products. Although animal protein is not essential, only high quality ingredients should be used in a calf starter. The crude fiber content should not be over 6-8 per cent.

Vitamins and minerals—When the amount of whole milk is limited the vitamin A and D intake may be inadequate. Therefore, many calf starters are fortified with A and D. The starter formulas given here contain irradiated yeast as a source of vitamin D.

Some of them contain dehydrated alfalfa meal as a source of vitamin A. If other vitamin A and D supplements are used, follow the instructions of the manufacturer. The need for vitamin A in the starter is greatest when roughages fed are of poor quality or when skim milk or whey is used in place of whole milk.

Trace mineral salt is recommended to provide salt, iodine, and cobalt.

Use commercial starters—There are many good commercial calf starters on the market. These should be used according to the directions given by the manufacturer. These starters are designed for use with the limited whole milk or milk replacer methods. Whether a prepared starter or a home mixed starter will be used is determined by price and convenience.

Ingredients in calf starter—Formulas for three calf starters are given on pages 123-124. If a specific in-

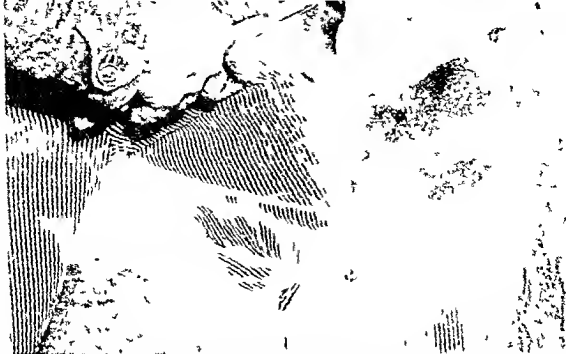


Fig. 5-5—Ear tagging a calf is a desirable method of identification. It is not as permanent as tattooing, but can be seen more easily.

gradient is not available or is too costly, a feed that has similar nutrient content can be substituted. In the first formula for example, 50 pounds of soluble blood flour, fish meal or meat scraps may be substituted for 100 pounds of dry skim milk. Distillers solubles may be substituted for at least half of the dried milk products.

Calf Starter Formulas

Simple calf starter that gives good results—

Ground yellow corn.....	400 lbs.
Ground or crushed oats.....	300 lbs.
Soybean oil meal.....	300 lbs.
Dried skim milk.....	100 lbs.
Steamed bone meal.....	10 lbs.
Trace mineral salt.....	10 lbs.
Irradiated yeast.....	$\frac{1}{4}$ lb.

This one contains dehydrated alfalfa, molasses and dried whey—

Ground yellow corn.....	200 lbs.
Ground or crushed oats.....	200 lbs.
Wheat bran.....	100 lbs.

Soybean oil meal.....	150 lbs.
Linseed oil meal.....	150 lbs.
Dried whey	100 lbs.
Molasses	50 lbs.
Dehydrated alfalfa meal.....	50 lbs.
Steamed bone meal.....	10 lbs.
Trace mineral salt.....	5 lbs.
Irradiated yeast	1/4 lb.

Starter containing distillers dried solubles and more molasses—

Ground yellow corn.....	200 lbs.
Ground or crushed oats.....	250 lbs.
Wheat bran	100 lbs.
Soybean oil meal.....	200 lbs.
Molasses (blackstrap)	100 lbs.
Distillers dried soluble.....	150 lbs.
Steamed bone meal.....	10 lbs.
Trace mineral salt.....	10 lbs.
Irradiated yeast	1/4 lb.

Milk Replacer Plan

Because of the demand for milk and milk products, there is increasing interest in replacing more of the milk in the calf's diet. The practical goal is to raise thrifty calves at the lowest cost. To meet this general goal, the use of dry calf-starters and the Limited Whole Milk Plan described previously were developed.

Use milk substitutes—"Milk substitutes" are being used to further reduce the whole milk required to raise a calf. Actually "milk substitutes" contain 50 to 90 per cent milk solids; thus the term is misleading. They are designed to replace whole milk when the calf is 10 to 14 days of age. These products are usually fed in the form of a gruel. When using "milk substitutes," manufacturer's directions should be followed carefully. Formulas for milk replacers are available; however, most dairymen prefer to buy them ready mixed.

Costs determine use—Varying degrees of success have been reported from the use of these feeds. However, calves can be raised satisfactorily on milk replacers when recommended procedures are followed. The calves develop rougher hair coats and in many instances make less rapid growth than calves fed more liberally on milk but at later stages they generally compare favorably.

Whether this system should be used depends on the market value of the milk saved and the cost of the "milk substitutes"; also the value of the calves and the labor and time involved in feeding these rations.

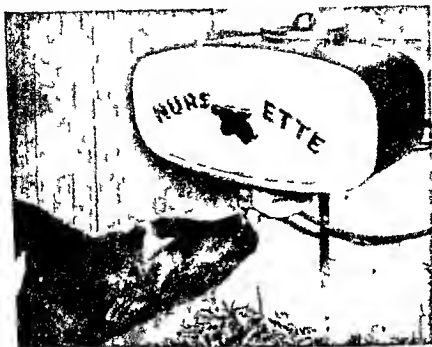
Feed skim milk—Excellent calves can be raised by the "skim milk" method.

Until the calf is about three weeks old, whole milk should be fed according to the schedule just given. Then a gradual shift to skim milk can be made, taking about a week to make the change.

Skim milk powder may be used successfully when the price is low enough to make it a good buy. One pound of skim milk powder equals 10 pounds of separator skim milk in feeding value. The dairyman can judge for himself the advisability of feeding dry skim milk to calves. Where fluid milk is sold at a high price and dry skim milk is relatively low in price, powder may be used to advantage. Mix one pound of powder with nine pounds (about one gallon) of warm water. Then use in the same way as liquid skim milk.

Increase amount gradually—Using the weight and condition of the calf as a guide, the amount of skim milk should be raised gradually, until about 15 pounds are being fed daily.

Feed younger calves first—Skim milk feeding may be continued until the calf is eight to ten months old. If the milk available for calf feeding is limited, calves under six months of age should have their allowance



Courtesy Nurs-Ette K and K Mfg., Minneapolis, Minnesota

Fig 5-6—An automatic calf feeder This is an electronically controlled automatic calf feeder which eliminates much of the bother of raising calves. The device uses powdered milk substitutes. Approximately fifteen calves are fed by one machine and provides warm milk available to calves at all times.

first, after which any surplus may be given to the older calves

Feed grain—Feed each calf grain free choice up to 4 pounds per day. When fed with excellent quality legume hay a concentrate mixture containing about eight parts of corn and oats and two parts of bran is suitable. If the hay is of poorer quality, replace 1 part of the corn or oats with linseed or soybean oil meal.

Use whey—If clean fresh whey can be secured, it may be fed to calves with fair success. However, before feeding whey make sure that it is pasteurized and will not introduce disease into the herd.

The change from whole milk to whey, when the calf is about four weeks old, should be made gradually over

a period of about ten days. Factory whey, being low in digestible protein, requires a high protein supplement.

Supplements for whey—One of the starters on pages 123-124 is a suitable supplement for whey when fed with good leafy, legume hay. If hay is of poorer quality be sure the starter is fortified with vitamins A and D.

Whole milk for maximum growth—Some dairymen, especially purebred breeders who desire greater growth, feed calves rather large amounts of whole milk—as much as 800 to 1500 pounds or more per calf.

Where this large amount of milk is fed, calves usually are given liberal feedings for about two months. The amount is then reduced and fed at lower levels until the calf is three to five months old.

When this plan is followed, the regular herd ration or a simple mixture such as the following may be used:

Ground yellow corn	400 lbs.
Ground oats	300 lbs.
Wheat bran	200 lbs.
Linseed oil meal	100 lbs.
Trace mineral salt	10 lbs.
Irradiated yeast	¼ lb.

Raising calves on nurse cows—Some dairymen prefer to raise calves on nurse cows. This practice is more often used by breeders of purebred cattle than by dairymen who keep cows primarily for the sale of milk. With this system, maximum growth is obtained. However, because of the large amount of milk used, the cost may be very high. There is less work than with pail feeding and there seems to be fewer troubles, especially from digestive upsets. Calves raised on nurse cows usually gain rapidly and develop a sleek hair coat.

Enough calves should be put on a cow so that each calf will get about 10 pounds of milk per hundred pounds of body weight daily. The calves can be weaned at 8 to 10 weeks and raised on a dry starter to four

months of age. Or they can be left on the cow up to four months, then put on a growing ration of grain and hay.

Feeding veal calves—Free choice feeding of whole milk is the best way to produce veal. Large calves will gain two to three pounds per day when fed liberally on whole milk and the carcasses will be of top quality. On the average nine to ten pounds of milk will be needed to produce one pound of gain. For best results veal calves should be fed from a nipple pail. Heavy milk feeding from an open bucket often increases scours and may cause other problems.

To produce top quality veal, feed calves whole milk only. Hay and grain feeding causes darker colored meat which brings a lower price.

Profits in producing veal are determined largely by size of calf at birth, value of milk and price of veal.

Give calves fresh water—Growing calves need plenty of fresh water at all times.

Calves over three weeks of age should be generously supplied with plenty of fresh water even when skim milk is fed.

During the first three weeks some precautions are necessary. Pail feeding fresh water is best. Avoid watering just before feeding milk. Pail feed fresh water until the calves become adjusted to normal allowance. Drinking cups may then be used satisfactorily.

8. Weaning the Calf

Unless skim milk is unusually plentiful, there is no advantage in feeding it to a calf more than six months old. At that time the normal calf has reached sufficient development to be able to handle enough grain and hay to continue its normal growth. The change from milk to a hay and grain ration only should be made gradually. First the feeding of milk should be limited to



Courtesy Chas. Pfizer and Co.

Fig. 5-7—Calf enjoying a ration highly fortified with vitamins and antibiotics. Fortified rations are most important when past ranch history indicates difficulty in raising calves.

once a day, and then the amount of milk should be reduced daily until in 10 days it is completely eliminated.

Feed grain mixture to older calves—When the calf is three to four months old, it should be sufficiently developed to make use of good-quality roughage and simple, economical grain mixtures. The growing mixture should be offered when the calf is three months old. Replace the dry starter with the growing ration gradually. At four months, the calf should be on the growing ration entirely.

Grain depends on roughage—The kind of grain needed, and the amount, will depend on the quality of roughage used. If the hay is of good quality and is largely legumes, four pounds of a 14-15 per cent protein mixture daily will be enough. If fair hay is fed, a 16-18 per cent protein mixture gives better results. Also more grain will be needed. The grain mixture fed

to the dairy cows in the herd is usually a satisfactory growing ration for older calves.

The amount of grain needed for calves over four months of age will be determined by their condition and the quality of the roughage. At four months of age the calves should be eating about four pounds of grain daily. As the calf gets older and eats more roughage the amount of grain can be gradually reduced. With good quality roughage fed liberally, two pounds of grain daily is sufficient for heifers over six to eight months of age.

Heifers that receive good quality roughage will make normal growth without grain after 9 to 10 months of age. This is especially true when part of the roughage is good corn silage. If the roughage is of poor quality, lacks palatability, or if grass silage is fed as the only roughage, grain feeding should be continued until they are 12 to 14 months old. Feeding heifers after a year of age is relatively simple, but they do need sufficient amounts of good feed to maintain normal growth. Good roughages are usually adequate, but if roughages are poor some grain is required.

Grain Rations for Calves over 4 Months Old

With good hay

14-15% Total Protein

Ground yellow corn	-- -- -- --	400 lbs
Ground oats	-----	300 lbs
Wheat bran	-- -- -- --	200 lbs
Linseed or soybean meal	-----	100 lbs
Trace mineral salt	-- -- -- --	10 lbs
Steamed bone meal	-- -- -- --	10 lbs

With fair hay

16-18% Total Protein

Ground yellow corn	-- -- -- --	300 lbs.
Ground oats	-----	300 lbs.

Wheat bran	200 lbs.
Linseed or soybean meal	200 lbs.
Trace mineral salt	10 lbs.
Steamed bone meal	10 lbs.

Teach calves to eat grain and hay—When about a week old, the calf may be encouraged to eat some grain. Here are two simple ways of encouraging grain feeding:

Place a handful of grain in the milk pail after the milk has been drunk. Or put some grain on the muzzle of the calf right after it has finished drinking milk.

Feed hay early—Choice green, leafy, legume or mixed hay—just a handful—should be offered the calf when it is a week old. To keep the hay fresh and tasty, replace it daily. Calves will eat more when hay or rations are pleasing to taste. When making hay, it is a good idea to put some of the best hay aside for calf feeding.

Use silage in calf rations—High quality grass silage is a good feed for calves and may replace part of the hay normally fed. If most of the hay is replaced by silage, precautions should be taken to insure an adequate supply of vitamin D in the feed. See page 133.

Good corn silage may also supply part of the calf's roughage. However, it is low in calcium and protein and should be fed in limited amounts to young calves. Calves relish corn silage and may eat too much of it which will prevent them from eating normal amounts of hay.

Good silage high in carotene—Well-preserved grass silage is a good source of a natural substance called carotene, from which the calf can make the important, protective vitamin A. Corn silage harvested by the early-dent stage and before frost is also a good source of carotene.

Antibiotics for calves—Antibiotics are used in many

commercial calf feeds. Studies have shown that the dairy animal most likely to benefit from antibiotics is the young calf. This is especially true on farms where calf raising is a problem.

Benefits vary with conditions—Trials at a number of experiment stations have shown that feeding antibiotics to calves from birth to two-four months of age resulted in an increase in weight gain of 15 to 25 per cent. In some trials there was very little or no effect while even greater increases have been observed in other instances. Part of the increase in weight gain is due to additional fleshing, but there is some increase in skeletal or bone growth as well. However, the antibiotic-fed calves which are larger than control calves at four months of age do not always maintain this advantage.

When to feed antibiotics—The greatest response to antibiotic feeding is from birth to two months of age. The young calves most likely to benefit are those that are making poor growth and those where scouring is a problem. Antibiotics may be of most use in feeding veal calves. Rapid early growth and good fleshing are essential for profitable veal production.

9. Supplying Vitamins

Under normal conditions, the young calf gets needed vitamins from natural feeds, provided these feeds are of good quality. Sometimes however the calf's feed falls below the desired level of vitamins A and D.

Vitamin A is important—The calf is born with almost no vitamin A in its system and depends on its feed for a supply of this important vitamin. The mother's first milk (*colostrum*) is an excellent source of vitamin A. Therefore, it is essential that the newborn calf gets a good feeding of *colostrum*. The mother's milk should be fed for the first week.

The amount of vitamin A in the colostrum and milk

is usually adequate to meet the needs of the calf. However, the vitamin A content of the colostrum and milk depends on the cow's ration. Therefore, a good supply of green roughages in the cow's ration during the dry period and after freshening helps to supply the vitamin A needs of the calf.

When to feed vitamin A—Under certain conditions, a vitamin A supplement may be necessary. If, for any reason, the calf does not get colostrum, vitamin A supplement is essential. If taken off whole milk before the calf starts eating hay, vitamin A supplement is desirable.

Roughages provide vitamins—Lack of vitamin A decreases the calf's resistance to diseases like scours and pneumonia. As the deficiency becomes more severe, growth and eyesight are also affected. After the *colostrum* and milk feeding period, calves get their vitamin A from the carotene in roughages. Fine-stemmed, leafy, green hay is a good source of vitamin A for calves. Pasture, corn silage and grass silage are also good sources of vitamin A. Calves fed whole milk and given roughages very early will get sufficient vitamin A. When the calf eats two to three pounds of green, leafy hay or silage daily, the needed vitamin A will be supplied.

Supply vitamin D—Vitamin D helps the calf utilize the calcium and phosphorus in its ration to produce strong, sound bones. When vitamin D is lacking, the calf becomes unthrifty, develops rickets and fails to gain normally.

Direct sunlight and sun-cured hays are natural sources of vitamin D. When the calf eats as much as one and one-half to two pounds of sun-cured hay per day, its need for vitamin D is taken care of. However, if the intake of vitamin D has been too low during the early weeks of the calf's life, rickets may develop even after the calf starts to eat hay. For this reason, it is

good practice to teach the calf to eat hay and grain early.

Further protection may be given by including irradiated yeast in feeds for young calves.

Provide salt—Salt must be provided for all livestock. In some areas of the country iodine and cobalt may be lacking and should be added to the feed. Check with your county agent before you add these minerals.

10. Providing Low Cost Feed

Pasture is one of the cheapest and best feeds dairy-men can produce. However, young calves cannot eat enough pasture to supply all of their needs. Therefore, it is a mistake to expect calves under six months of age to get a large part of their feed from pasture.

Use grass paddocks for young calves—Calves under six months of age should get most of their nutrient requirements from grain and good roughages. Spring calves are usually kept in the barn the first summer. But a grassy paddock with plenty of shade and a shelter provides an excellent place for calves to get exercise, fresh air and sunshine. The paddock should be clean and well-drained and should be next to the barn or a shed so that the calves can go in and out at will.

When the calf is in a lot, it will get plenty of vitamin D from the sun. Exercise and fresh air help to keep calves thrifty.

When to pasture calves—After calves reach the age of six months, good pasture will provide their roughage. However, until they are about a year old some grain is needed. Usually two to four pounds daily is adequate.

A good calf pasture should contain a lush growth of young forage. Plenty of shade and shelter must also be available. Shelter may be provided by either having the calf lots adjacent to the barn so the calves have free access to a stall or by using a separate shed in the

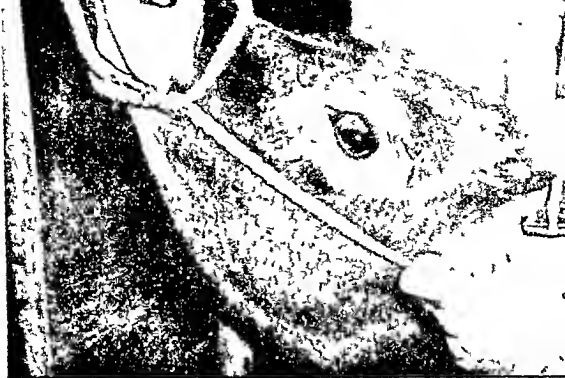


Fig. 5-8—The proper method of tattooing a calf is illustrated in this picture. Light skinned animals show up best when tattooed.

lot. Since grain must be fed, it should be located near the feed storage. A good supply of clean water should be available to the calves at all times.

While pasture of any variety is an excellent feed, a mixture of legumes and grass is preferable. Mature plants are less palatable and less nourishing than young growing plants. Therefore, for the most efficient use of the pasture, prevent the plants from getting over-ripe. Rotating the calves between several small plots is much better than allowing them to graze continuously in one large field. Clip the mature plants if the pasture gets ahead of the calves.

Protect from flies—Flies are very annoying to calves on pasture and are often neglected by the dairyman. Effective sprays for flies are readily available and should be used on calves. Be sure to use water suspension sprays since the hide of young calves is very sensitive to oils.

Keeping the stall or shelter darkened provides the calves with a place where they can get away from flies.

These young stock shelters and stalls are the most common place where flies breed on most dairy farms. Therefore, to do a good job of fly control these must be kept clean.

Cattle Grubs Can Be Controlled

Older heifers and cows are often affected by cattle grubs. These grubs are the immature small-fly stage. The flies that are responsible for these grubs attack the cattle in spring and early summer, causing the animals to run in the pasture and seek shelter in brush, trees, or barns.

Spraying the animals helps kill the mature flies. The larvae can be easily killed by the use of rotenone powder. Prepared dust containing 1.5 per cent rotenone is recommended. Apply the dust liberally to the backs of the animals and thoroughly rub it into the hair. Treat when the bumps are noticeable to touch, usually in late February or early March. A second treatment a month later is sometimes needed to kill late grubs.

For most effective control of cattle grubs, all the herds in an area must be given a complete treatment.

Use systemic poison—New materials which can be fed to cows to control grubs are on the market. See chapter on diseases.

11. Removing Unsightly "Extra" Teats

A good udder with four well-placed, well-shaped teats is important in a dairy cow. Extra teats on the udder of a cow are unsightly and should be removed while the heifer calf is still small—under six months of age—and easy to handle. The best time is when the calf is four to six weeks old.

Use iodine before and after—A good method is to tie the calf securely and apply iodine or some other reliable disinfectant to the teat that is to be removed. Then

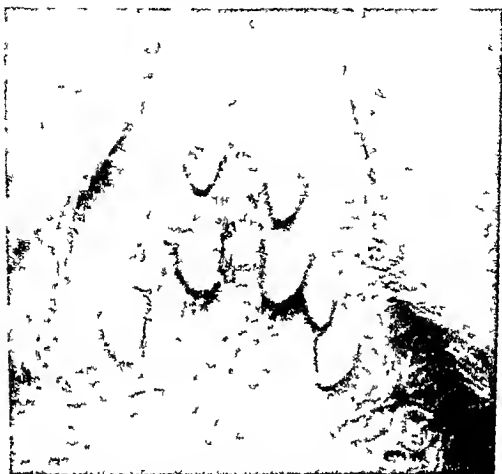


Fig 5-9—This picture illustrates which teats should be removed



Fig 5-10—This picture shows the proper way to remove "extra" teats

draw teat down as illustration on page 137 shows and snip off cleanly at the line where the teat joins the udder. Use sharp shears or an emasculator. Swab the spot with iodine *after the operation* as well as before. If flies are present use a fly spray repellent on the wound. There is seldom any bleeding.

If heifers are older, the wound may be so large that stitches will be needed to close the skin for proper healing. *Do it early. It is important, of course, to be sure that the teats you remove are "extras."*

12. Dehorning Calves

Horns serve no useful purpose on dairy cattle; they can be a nuisance and cause many body and udder injuries. Hornless cattle are no longer discriminated against in show rings or sales.

Dehorn early—If dehorning is done properly, when horn buttons are very small, a neat, clean job can be done with little discomfort to the animal. After a little experience, the dairyman will find dehorning a simple task.

Use caustic potash—Caustic potash is very satisfactory for dehorning calves. Also caustic sticks, ready to use, are economical and available in most communities.

Plan to dehorn when the calf is four to ten days old, or as soon as the horn buttons can be easily detected—the earlier, the better.

Remove the hair from the horn button. Moisten the caustic stick and rub vigorously over the horn button using a circular motion. When the skin softens, start working on the other horn and then come back to the first. When enough caustic has been applied, the skin will have softened so that it can be broken easily with the end of the caustic stick.

Be careful with caustic. Avoid using too much. It

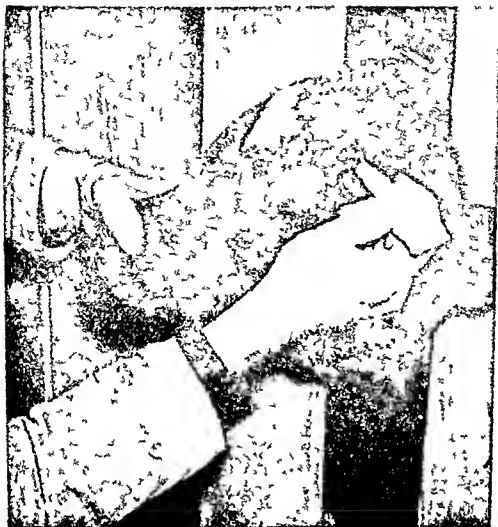


Fig. 5-11—Apply caustic potash at an early age to properly remove horns. Note the potash stick is wrapped in paper to protect the operator's hands.

is not necessary to take off the entire horn at the time of the operation. The caustic will continue to work and destroy the horn. Place a ring of petroleum jelly or grease around the horn button following the caustic application. This prevents the caustic from running down the calf's face and getting in the eyes. Protect your fingers by keeping paper wrapped around the caustic stick. Store caustic in a sealed jar or tightly stoppered bottle; moisture makes it unusable.

Use electric dehorers—Many dairymen use electric dehorers for removing horns. These are similar to large soldering irons with hollowed tips that fit over the

horn. The irons are available in different sizes, or with exchangeable tips of different sizes.

Follow directions supplied with the electric dehorner. The hot iron is placed over the horn button and the skin around the horn burned away. By carefully following the directions supplied with the irons and after some experience, a calf can be dehorned in about one minute. These dehorner come in different sizes for calves of different ages but best results are obtained when used on calves not over two months and preferably under one month of age.

Other dehorning methods—*Liquid and Paste preparations* which contain caustic reagents work well. They should be used according to manufacturers' directions. These work similar to caustic sticks and give best results when used on calves four to ten days old.

13. Providing Dry Well-Ventilated Quarters

Young calves need clean, well-lighted and properly ventilated quarters. Damp stalls and wet bedding may lower the calf's resistance and lead to pneumonia or other infections. Plenty of fresh air is needed but drafts and dampness must be avoided.

A satisfactory individual calf stall should be at least two and one half by four feet. It should be designed to prevent drafts but allow good ventilation. Each stall should be provided with a hayrack, feed box and a place for a water pail.

Some dairymen prefer to handle calves in individual box stalls. Such pens are available commercially or may be homemade. They should meet the requirements set forth above.

Calves are best kept separate until they are six to

eight weeks old or until they are weaned from milk. At this time they can be grouped according to size and age in larger pens. This permits them more exercise which is desirable. While very young calves may be rather closely confined without harm, older calves should be given the opportunity to get plenty of exercise.

On some farms it is difficult to provide separate pens for young calves before weaning. In cases where calves must run with other calves at this age, some method of restraining them while they are fed milk is desirable. They may be tied or stanchioned until they have been fed grain and the urge to suck one another has passed.

At seven to eight months of age, healthy calves will get along very well under a loose housing arrangement. They should be grouped by size and fed plenty of good roughage along with enough grain to keep them in satisfactory growing condition. A well-bedded, dry shed, open to the south, is ideal for heifers of this age.

14. Common Calf Ailments

This brief outline may help you recognize the common ailments and assist in giving first aid treatment. A veterinarian should be consulted when symptoms of disease or other ailments are noticed.

Common Scours (Non-specific)

Cause—Poor nutrition, bacterial infection, internal parasites.

Reason—Over feeding, dirty feeding buckets, poor sanitation in general, and cold, damp pens.

Symptoms—Watery diarrhea, soft and fetid stools, loss of weight. Commonly occurs in young calves one to three weeks of age. Occurs in older calves if internal parasites are present.

Prevention—Feed colostrum milk within 15 minutes after calf is born. Feed warm clean milk regularly and be sure feeding buckets and other equipment are clean. Avoid over feeding of milk to young calf. Stalls or pens must be clean, dry, well lighted and ventilated.

Treatment—Find and correct the feeding and management practices that are causing trouble. Sulfonamide and antibiotics given on advice of veterinarian. If internal parasites are suspected get advice on diagnosis and treatment from veterinarian.

Continue to feed—It has been a general practice to withhold feed should a calf scour. Many dairymen now prefer to continue to feed almost the normal amount of milk and rely on modern drugs and antibiotics to clear up the scours. When feed is withheld calves tend to become weak and dehydrated from lack of feed.

White Scours (Infections)

Also called Calf Pneumonia Enteritis (C.P.E.)

Cause—Virus and bacterial infection.

Reason—Viruses are carried on dust particles throughout the closed barn. Virus may be coming from a carrier cow in the herd.

Symptoms—Very watery diarrhea, excessive drooling from mouth, sunken eyes, and calf becomes very weak. Occurs first day or two after birth and calf usually dies second day after symptoms are seen.

Prevention—Be sure calf gets colostrum within 15 minutes after birth. Isolate sick calves. Avoid bringing carrier cow into the herd. During good weather let cows calve outside.

Treatment—No treatment effective after symptoms are seen. Ordinary scours treatment entirely useless. If you have trouble get advice from veterinarian on

use of specific antibiotic as a preventative treatment before disease develops.

Pneumonia

Cause—Bacteria; viruses and lung worms.

Reason—Exposure to drafts, damp, cold pens and poor ventilation. Getting milk in lungs by having nipple pail hung too high.

Symptoms—Coughing, fast breathing, fever, lack of appetite for feed, craving for water and discharge from eyes and nose.

Prevention—Keep calves in dry, ventilated quarters. Avoid direct drafts and overcrowding.

Treatment—Put calf in dry clean quarters. Sulfonamides and antibiotics on advice of veterinarian.

Ringworm

Cause—Fungus.

Reason—Calf or heifer comes in contact with an infected animal. Also blankets, sacks, curry combs or other equipment may be contaminated. Flies, ticks or lice may act as mechanical carriers.

Symptoms—Hair usually comes off leaving scabby, crusted, circular areas usually on the head, neck and shoulders. May spread to other parts of the body.

Prevention—Avoid introduction of infected animals. Isolate infected calves. Disinfect all equipment that has possibly been contaminated. Expose calves to sunlight.

Treatment—Early recognition and treatment is important. Scrub infected areas with brush and soapy water. Paint with tincture of iodine or other fungicide recommended by veterinarian. If infection does not improve in three to five days of treatment, consult veterinarian on further therapy.

External Parasites

Cause—Lice, ticks, fleas.

Reason—Infested animal is brought into the herd. Also blankets, brushes and other equipment may be a source of infection. May get ticks in wooded pastures.

Symptoms—Rubbing and scratching, rough hair coat and slow growth. May rub off hair in spots. Excessive shaking of head is indication of ticks in the ears.

Prevention—Do not bring in infected animals or equipment; keep calves out of woods.

Treatment—Lice and Fleas—spray or dip with .025 per cent lindane or dust with 1.5 per cent rotenone or 1 per cent lindane. Ticks—spray or dip with 0.5 per cent toxaphene, .5 per cent D.D.T. or .025 per cent lindane.

Internal Parasites

Cause—Many kinds of worms. Stomach worms and lung worms most common. Read discussion on scours and pneumonia.

Reason—Worms' eggs in the manure from infected animals. Tiny worms develop and are later eaten by other calves and heifers.

Symptoms—May be contributing cause of non-specific scours, and pneumonia. Rough hair coat and poor growth. Symptoms vary with the amount of infestation. If parasites are suspected, check with veterinarian.

Prevention—Keep calves in clean pens or pasture lots. Younger animals get infection when exposed to areas occupied by older animals. Phenothiazine can be used as a preventative treatment. Check with veterinarian.

Treatment—*Phenothiazine* can be used to control roundworms. It can be used as a therapeutic treatment or fed continuously at low levels as a prevention.

Dictyicide is used for lungworm treatment. It is most effective when used before calves are heavily infested.

Before using these drugs, get advice from your veterinarian on methods of giving the treatment and the dosage to use.

Vaccinate for brucellosis—Brucellosis ("Bang's disease") has been reduced greatly. However, there are still some infected animals; therefore, dairymen must not get careless. Every precaution should be taken to prevent exposure to infected animals and keep resistance as high as possible.

Vaccination is available in many states at no direct cost to the dairyman. Contact your local veterinarian or county agent for detailed information. Calves must be vaccinated between four and eight months of age. If calves are eight months or more before vaccinated, they are more apt to retain a positive reaction to the milk and blood test. A positive test makes it necessary to eradicate the animal.

Report calves for vaccination when four months old—This gives your veterinarian time to get the vaccination done well ahead of the eight month deadline. For best results, early maturing breeds and fast growing heifers should be vaccinated between four and six months.

15. Checking Gains of Heifers

The only dependable way to check the rate of growth is to weigh or measure the calves from time to time. Wisconsin Bulletin 359 gives information on age and weight or measurement. This tells how to measure with a tape to determine the rate of gain of calves and heifers. The directions they give are easy to follow.

Draw an ordinary household tape snugly around the body just back of the shoulders. Check measurement on the tape against the table on page 146, according

Age of Heifer	HOLSTEIN		GUERNSEY		JERSEY	
	Weight in pounds	Heart Girth-inches	Weight in pounds	Heart Girth-inches	Weight in pounds	Heart Girth-inches
3 months	200	40	140	37	125	35.5
6 months	375	49	275	45	250	44
9 months	525	55	400	51	375	50.5
12 months	675	59	500	54	475	55
15 months	800	54	500	57.5	550	56
18 months	875	65.5	675	60	620	61
24 months	1100	72	875	65.5	775	66.5

to age and breed. Note that breeds differ in both size and weight.

Key points of chapter—*Successful calf raising begins with the feeding and care of the cow before the calf is born.*

Colostrum milk is important in giving the calf a good start in life.

See to it that the calf pen, the feeding pails, and everything about the young calf is kept clean.

Provide dry, well-ventilated quarters.

The calf grows much faster if it is never allowed to get "off feed."

Avoid overfeeding milk and sudden changes in feeds and feeding methods.

Calves need some grain until they are about a year old.

CHAPTER VI

FEEDING THE DAIRY HERD

No dairyman can be a real success unless he uses up-to-date methods in feeding the dairy herd. Feeding is a scientific business. Of course, you can "get by" like many farmers do. They merely shove some hay and grain in the cow mangers and let it go at that. The only trouble with that type of program is that the dairy herd won't make money. To be successful you need to know how to balance the feed ration, that is, how much of the different kinds of feed to provide in order to get good milk production. You also need to keep production records of each individual cow because a cow should be fed according to the amount of milk she produces. That will mean the most economical milk production.

Feeding and Providing Feed

Feeding is also tied up with the question of producing the feed on the farm. A good dairyman asks himself, "What crops shall I grow or feed and how much of each kind of crop?" If one misguesses on the feed requirements and runs short he either has to underfeed or he may have to pay premium prices on the market. Either one means a loss of income.

The dairyman must have a flexible feeding plan by which he can use effectively the feed supply which he has each year. The plan must provide good nutrition consistently but must be simple and workable. It must supply the needs of all of the animals in the herd without requiring a large number of different feed mixtures.

The substances which the animals require from their

feeds are known as nutrients. The principal nutrients are: proteins, carbohydrates, fats, minerals, vitamins, and water.

The animal requires nutrients for several purposes:

- (1) to maintain her own weight
- (2) for the growth of a young animal
- (3) for the production of milk
- (4) for the development of the unborn calf for a cow that is pregnant.

In this chapter we shall point out some of the important things to follow in the feeding program in order to get the best returns on the dairy herd.

Suggested Activities Which Involve Approved Practices

1. Producing roughage feeds.
2. Age of pasture.
3. Cautions on pasturing alfalfa and other legumes.
4. Using soybean hay as a forage crop.
5. Using other feeds than legumes.
6. Producing hay for feed.
7. Feeding silage.
8. Utilizing grass silage.
9. Concentrate feeds.
10. Providing minerals.
11. Stock tonics.
12. Antibiotics.
13. Using hormones.
14. Feeding urea.
15. Toxic feeds.
16. Poisoning.
17. Preventing milk flavors.
18. Balancing the dairy ration.
19. Feeding according to production.
20. Looking for best buys.
21. General rules for feeding dairy herd.

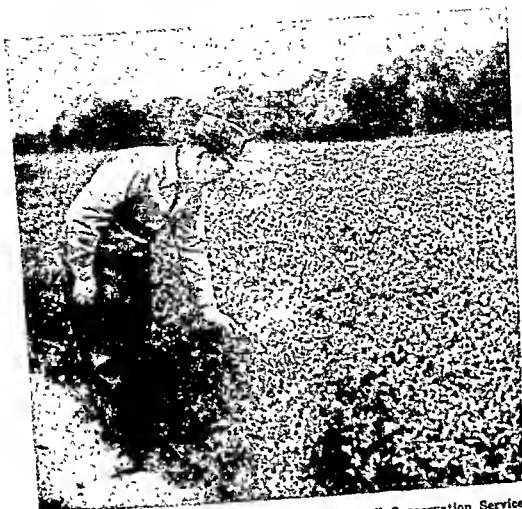
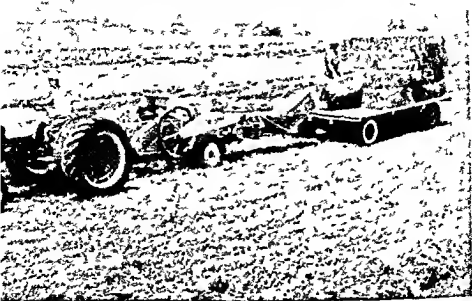


Fig. 6-1—An excellent stand of Crimson Clover. Legumes such as this form the basis for feeding a dairy herd.

1. Roughage Feeds and What Kinds to Produce

If you look at the main dairy regions of the country, you will find that the most important thing for successful dairy farming is the type of crops produced. Of all the feed crops in the northern and central parts of the United States, alfalfa and the clovers are the most important roughages for dairy cattle. Farther South in the U. S. a crop called *lespedeza* is grown which is somewhat similar to alfalfa and the clovers. It is well adapted to those areas and is an excellent dairy feed. However, in the northern half of the U. S., alfalfa and the clovers are the giants of the dairy roughages.

Alfalfa, the clovers, *lespedeza*, and several other



Courtesy J. I. Case Co.

Fig. 6-2—A cheap source of good roughage is the first step in a desirable feeding program. An economical source of feed is imperative for success in dairying.

crops such as peas and beans are called "legumes" or "leguminous crops." These are crops that gather nitrogen out of the air and "manufacture" it into proteins which are very high in feed value for livestock.

It's uphill business to run a successful dairy herd unless the farm will produce good yields of alfalfa, the clovers, (or lespedeza in the South). You can put that down as a basic principle.

A mixture of pasture grasses and legumes is perhaps more common than pastures of legumes alone. However, we shall refer to pastures which are legumes entirely or legumes and other grasses as legume pastures.

The reason that a legume pasture is so important is that it provides an inexpensive high value feed. In fact it provides the most economical feed for the dairy herd. Of course, any good pasture gives the advantages of letting the cows do their own harvesting, thereby saving you the work. The United States Department of Agriculture says that a good pasture can furnish nearly one-third of the total feed consumed by the animals during the year. This one-third of the total nutrients

(or nourishment) amounted to only one-seventh of the total annual feed cost. This gives you an idea of the savings that are made by having good pastures.

2. Age of Pasture for Best Result

Pasture grass is more valuable when the plants are reasonably young than when they become matured and weathered. The best economy of the pasture is obtained when there are enough cows on it so that they will eat it when it is growing actively. On the other hand, if the pasture is too closely grazed it will not produce as much forage as when it is allowed to obtain a reasonable growth.

3. Caution on Pasturing Alfalfa and Other Legumes

Legumes are one of our very best pastures but it isn't safe to turn the cows on a legume pasture and forget about them. The legumes are liable to cause bloat. This danger is greater before the plants have reached the stage of blooming. (See Univ. of Ill. Bulletin 496, Michigan Circular 189, Wis. Bulletin 496 and Wis. Extension Circular 344.)

It is especially risky to turn cows out on these pastures at night when you can't watch them. It's mighty depressing to wake up in the morning, look out over the pasture and see two or three dead cows!

A much safer practice is to have the cows on good pasture grass—other than legumes—at night and let them graze on legume pasture only during the day time. (For details on preventing bloat see the chapter on diseases.)

Why Legumes Are So Valuable As a Forage

There are at least four reasons why legumes, especially alfalfa and the clovers in the North and Central U.S., and lespedeza in the South, are so important.

1. You will find that the yield per acre of legumes is greater than for most any other hay or pasture crop.
2. Legumes have a much higher percentage of digestible protein than hay from other forage crops.
3. Legumes are high in calcium, Vitamin A and, if the hay is properly cured, it is also high in Vitamin D.
4. In addition to being an excellent feed crop for your dairy herd, legumes help maintain soil fertility, so important to any farm. This is especially true if the legumes become one of the crops of a crop rotation system.

4. Soybean Hay As a Forage Crop

So far we have talked most about alfalfa and the clovers as good legume crops.

Soybean hay has become popular with many dairy farmers as a legume feed crop. There is usually a little more waste in soybean hay than there is with alfalfa and the clovers, but if the soybean hay is chopped, the cows will eat practically all of it. It is well to feed it along with other roughages.

The soybean crop can also be used as a silage, preferably mixed with corn or sorghums, using about one ton of soybeans with two to four tons of corn forage.

5. Other Feeds Than Legumes—Grasses

There are many parts of the country where legumes can't be grown successfully. In these areas farmers have to turn to something else as pasture and feed for their milk cows. Grasses such as timothy, blue grass, red top, brome grass, orchard grass or the wild native grasses, will provide grass or hay with good feed value even though they are low in protein compared with the legumes.

Many farmers make the mistake of cutting prairie hay so late in the year that it has lost part of its feeding value. For example, the Nebraska Experiment Station found that calves fed on hay cut in July made twice as good gains as those fed on hay that was cut a month later. Hay cut in September had very little feeding value.

Small Grains for Pasture and Hay

In the south, and also in the central states (the winter-wheat states), grains, in their earlier stages of growth, are used for pasture with good success. Winter wheat and rye are the more common fall and winter pasture crops. However, winter barley and oats are used in the states farther south.

If the hay from small grains is well cured it will have a feeding value about equal to timothy hay. This means that it is so low in proteins that it needs to be supplemented with high protein feeds to provide enough protein for a good milk flow.

6. Hay As a Feed

While pasture is the most important of all dairy feeds, hay is the most important harvested roughage. Of course, there are many roughages besides hay, such as silage, roots and even certain kinds of straw. One has to remember that hay must be well cured and properly stored if it is to have a high feeding value.

Here are some key points on how to harvest our hay crops:

- a. Hay cut so late that it has matured and weathered has lost part of its feeding value or nutrients. For best results, cut the hay in the early stage of maturity.
- b. Cure the hay so it stays leafy and green in color, and so the stems are soft and pliable. Woody stems have very little feed value.

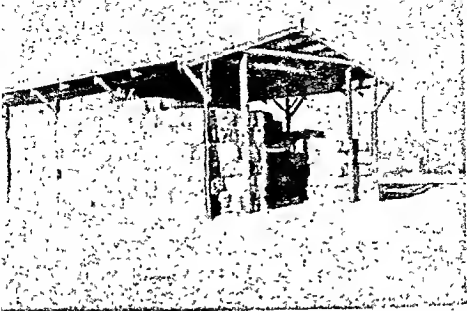


Fig. 6-3—Hay properly protected in a desirable low-cost hay shed. Loss of nutrients is cut to a minimum under these conditions.

- c. Hay should be dried so that it is free from mold or mustiness.
- d. To be at its best, hay should be reasonably free from weeds.
- e. If you have a large hay crop start haying soon enough so you can finish before the last of it gets too mature.

Dry the hay just enough so you are sure it can be stored without heating or without becoming moldy. If the hay is chopped or baled it has to be a little drier than if it is stored loose in its natural form.

Of course, no matter how careful you are in hay-making, there will be some loss in its feeding value in the process of curing it. There are three main causes of this loss.

1. Some of the leaves drop off when the hay is raked or loaded. The loss from this shattering is heavier than we realize because the leaves have much more feeding value than the stems. They are richer in protein, vitamins and minerals. Besides it's the leaves that make the hay tasty to the cows

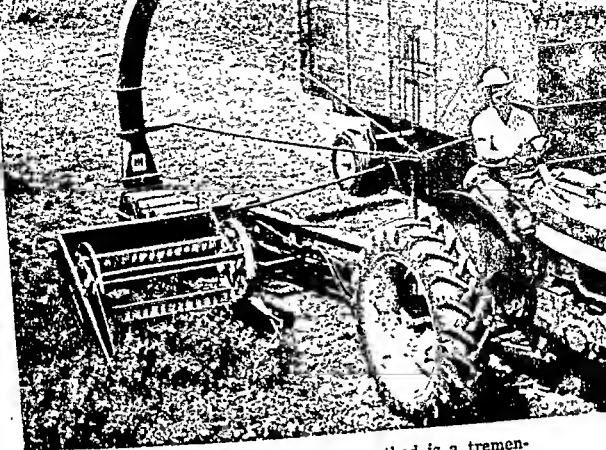


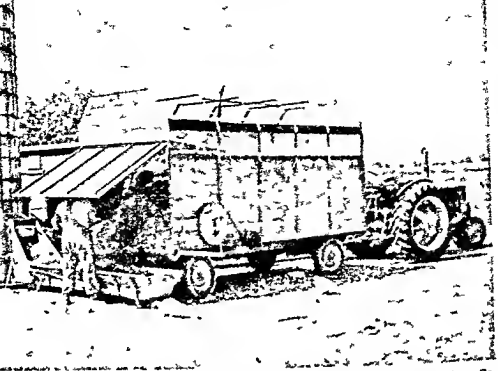
Fig. 6-4—Field chopping hay. This method is a tremendous labor saver and results in excellent quality hay if properly operated and hay is either fed or cured.

and calves. Naturally the drier the hay becomes the greater will be the loss of leaves.

2. Even under favorable field conditions, there is a certain amount of loss of nutritive substances such as sugar. Actually they are turned to other substances. We call this fermentation. Hay that is properly cured will lose less than if it is poorly cured.

If hay is exposed to the sun for too long a period it becomes bleached. This means a loss of some of its feeding value.

3. Leaching is another way that loss occurs. If hay that has been cut is caught in heavy rains, as much as one-half of the protein may be lost. Of course, if heavy rain comes while the hay is down there is little that can be done about it. However, one thing is important, rain soon after the hay is cut is not as serious as that same



Courtesy J. L. Case Co.

Fig 6-5—Successful dairymen save labor. Here silage is unloaded into the hopper and blown directly into the silo.

amount of rain after the hay is pretty well dried out. For that reason it will pay to get the hay put up just as soon as possible after it has been cured. Some farmers always seem to "just get under the wire" in getting their hay up. Others let theirs get caught in a bad rain. That's probably the difference between good and poor management.

7. Feeding Silage

Corn is the key crop used for silage, although other crops, especially sorghums, also make good silage.

There are several reasons why silage is such an important feed for your dairy herd. Here are four of the more important ones:

1. Silage makes it possible to keep a large dairy herd on the farm because of the heavy yield per acre of silage crops such as corn or sorghum.

2. The cost of silage is low compared with its food value and with the cost of other feeds.
3. There is generally less loss of feed value and therefore less work in making silage than in making hay.
4. If your crop is weedy there is always a danger of spreading the weed seeds. Many weed seeds are killed in the process that the silage goes through.

8. Grass or Hay Crop Silage

During recent years we have heard much about grass silage. Grass silage is more difficult to make than corn silage because the grasses contain less sugars than corn or sorghums.

However, it can be made and is used satisfactorily by many dairymen.

9. Concentrate Feeds

So far we have discussed the *roughage feeds* such as grass hay, and silage. Now we shall turn our attention to what we call concentrate feeds: (1) grains, (2) the by-products of grains, such as bran and middlings, and (3) certain feeds very high in protein, as for example, linseed meal, soybean oil meal, cottonseed meal and peanut meal. The successful dairyman feeds concentrates in addition to the roughages. (A little later we shall discuss the methods of deciding how much of each kind of feed to give the cows in the dairy herd. We call that "balancing the ration.")

Corn and Oats

Corn is the most common of our grain feeds and is excellent if it is fed along with other feeds so that a well balanced ration is obtained. It is rich in starch but low in protein so it is necessary to feed some high protein feeds with it.

Oats are also a very popular dairy feed in some parts of the country and you will find it a part of the ration of good dairymen, especially those who grow oats on their farm. Both oats and corn should be ground before they are fed to dairy cows. However, grinding is not so necessary for calves. (See chapter on calf raising.)

Other Farm Grown Grains

Several farm grown grains such as wheat, barley or rye, are fed satisfactorily by dairymen. Wheat is a good feed. Pound for pound wheat is worth about 5 per cent more than corn, 10 per cent more than barley or rye, and 15 per cent more than oats, bran or wheat middlings. The Wis. Experiment Station has found that all farm animals like wheat and do well on it. In most cases it is best to mix wheat with other grain up to about 50 per cent wheat in the mixture. Animals like it cracked or ground medium fine rather than fine.

Wheat has 13 per cent protein as compared to 15 or 16 per cent in bran. It has less fiber than bran and has nearly 20 per cent more total digestible nutrients.

Wheat grown in the South and far West has a lower percentage of protein than does the hard winter and spring wheat.

Wheat By-Products

Wheat, bran and wheat middlings are among the most popular dairy concentrate feeds. They are richer in protein than the farm grains but not as rich as feeds such as corn, gluten feed, or peanut meal, and they are much lower in protein than linseed meal, soybean meal or cottonseed meal. Oat mill feed, a by-product of oat-meal manufacture, has been used in rations for dairy cattle. Wis. Sta. Bull. No. 441 gives the result of an extended experiment on feeding oat mill feed in the dairy ration.

Feeds Rich in Proteins

The rich protein feeds are composed mainly of what are generally called oil by-products. These are obtained mainly from soybeans, flaxseed, and cottonseed. Peanut cake, coconut cake and corn germ cake are of minor importance. Here is what Professor Sleeter Bull and W. E. Carroll say about concentrate feeds in their *Principles of Feeding Farm Animals* (Interstate Press, Danville, Illinois) :

"Soybean oil meal compares favorably in feeding value with cottonseed meal of equal protein content. It fulfills three of the requirements of an especially desirable high-protein feed—it is palatable, has a good effect on the animals, and is highly digestible. When this feed is used to balance a ration consisting of farm grains and good-quality roughages, there is likely to be no deficiency in the quality of the proteins. So far as known, soybean oil meal has no harmful effects when used in proper proportions and may be used more freely in balancing rations for dairy cattle."

Linseed cake or meal is one of the most valuable and useful by-products. It not only has a high feeding value but, unlike cottonseed cake or meal, it is a safe and usually a profitable feed with any kind of animals. In addition to its high feeding value, it is very appetizing, has a slightly laxative effect, and imparts to the hair of the animals a glossy look indicative of thrift. As its chemical composition indicates, linseed meal should not be used as a sole concentrate of the ration, but in connection with less nitrogenous concentrates.

Linseed meal is one of the best supplementary concentrates for growing animals, both on account of its high feeding value and its physical effect. It is a very important addition to the ration of the skim milk calf. For growing cattle, it may form as much as 12 per cent



Fig. 6-6—This giant hopper contains concentrates which are all handled mechanically even to measuring and giving each cow her proper amount. Note the auger leading into the milking parlor.

of the concentrates of the ration when not too expensive.

Up to three pounds per day, linseed meal will improve almost any dairy ration. An excess of linseed meal tends to produce a soft butter.

Cottonseed cake, or meal—Cottonseed cake is the residue remaining after most of the hulls and lint have been removed and the cottonseed have been crushed, heated, and the oil pressed out in a manner similar to the manufacture of hydraulic process soybean oil meal. Cottonseed meal is the finely ground cake, although it is sometimes sold in the pea or nut size, especially in the West or where it is fed in the open and likely to be blown away by the wind.

10. Providing Minerals

Needs for calcium, or lime, are met when legume hays are fed liberally. Where legumes are not to be

had, and especially where soils are acid, it may pay to add 1 to 2 per cent finely ground limestone to the grain mixture. When bone meal is used, it supplies calcium as well as phosphorus, and there is no need for additional lime.

Phosphorus is supplied when the mixture contains as much as 20 per cent wheat bran, linseed meal, or cottonseed meal. When less than this amount of these feeds is used, and where the soils are low in phosphorus, it may be wise to add 2 per cent of bone meal or defluorinated rock phosphate to the mixture, or to give free access to a bone meal and salt mixture (made of 90 pounds bone meal and 10 pounds salt).

Potassium iodide should be added (1 oz. to 300 lbs. salt) in iodine deficient areas.

Cows like some feeds better than others. For best results use no more than 50 per cent wheat, 35 per cent rye or 25 per cent malt sprouts in grain mixes.

If the grain mixture lacks bulk, feed it on the silage.

High producing cows—fed liberal amounts of grain—need variety and bulk in the ration more than average cows.

Use commercial mineral feeds—The commercial mineral feeds are sold primarily as a source of minerals. According to Wis. Cir. 467, they should be purchased on the basis of the amounts they supply of the minerals which are needed. The two major minerals ordinarily included are calcium and phosphorus. The calcium and phosphorus content of mineral feeds must be stated on the label. The label must also state the ingredients, and the amount of salt, if any, which is included. Since most mineral feeds sell at a much higher price than salt, it is often added as a filler.

In evaluating mineral feeds for dairy cattle, it is well to remember that they are much more likely to

need phosphorus than calcium. A dairy cow mineral feed should contain at least half as much phosphorus as calcium. The most common fault of commercial mineral feeds is their low phosphorus content. In contrast, the calcium content is usually high. Many of the lower priced mineral feeds contain only from two to five per cent phosphorus, with 20 to 30 per cent calcium. The obvious reason is that ground limestone and other sources of calcium are very inexpensive.

Bone meal is a standard by-product feed which is practically made to order for a dairy cattle mineral. The bone meal labeled "Feeding grade steamed bone meal" is suitable for feeding to dairy cattle. It usually contains 12 to 15 per cent phosphorus and 25 to 30 per cent calcium. It is actually worth from four to six times the price of many of the low-phosphorus mineral feeds. It is usually available at a price slightly above that of the cheapest commercial mineral feeds, but considerably below that of the better ones. Bone meal may serve as a standard for evaluating commercial minerals. Mineral feeds should be compared to bone meal primarily on the basis of the cost of the phosphorus they supply. Dicalcium phosphate and defluorinated rock phosphate are fully equal to bone meal and may be used if available. In buying dairy cow minerals, we will not need to worry about calcium. All minerals which we buy to supply phosphorus will also supply more than enough calcium.

11. Stock Tonics

For many years dairymen have been besieged by manufacturers of stock tonics or conditioners. These are advertised very extensively and are often sold directly through agents who call at the farms. Since they are not sold as feeds to supply major nutrients, no statement as to content of any nutrients is required. The ingredients must be listed.

Such preparations often contain substances ordinarily used to stimulate appetite, such as ginger, capsicum, nux vomica, quassia, fenugreek, etc. They also frequently carry charcoal, sodium sulfate (Glaubers salts), magnesium sulfate (Epsom salts), iron sulfate (copperas), bicarbonate of soda (ordinary baking soda), yeast, and various other compounds. Of more recent years "shotgun mixtures" of vitamins and trace minerals have been added to many of them. Some even have antibiotic materials added. Anise and licorice are commonly added to make the odor and taste more appealing. They may not appeal to the cow as much as to the owner, but he, not the cow, buys the feed.

The chief objection is the cost. For the most part the ingredients are harmless.

Occasionally claims are made that such preparations will cure or prevent such diseases as Bang's disease or mastitis. No drug or preparation which will do this when fed to cows is known to the veterinary profession.

12. Antibiotics

Discovery that some of the antibiotics and by-products of their manufacturer have valuable growth promoting qualities has led to the use of these substances in feeds for livestock.

The advantages of antibiotic feeding seem to be derived from their effect on the bacteria of the digestive tract. With dairy animals antibiotic feeding has shown greatest benefit for young calves. Antibiotic feeding to dairy cows is complicated by possible adverse effects on rumen bacteria and the occurrence of residues in the milk.

General recommendations for the use of antibiotics in dairy cow feeds does not seem justified until more satisfactory evidence of benefits is available.

Low level daily feeding of certain antibiotics to milking cows has been approved by the Food and Drug Administration as presenting no hazard of harmful residue in the milk. If such antibiotics are fed, it is important that the recommendations of the manufacturer be followed.

13. Hormones—Thyroprotein—Stilbestrol

Hormone substances secreted by various glands of the body, play an extremely important part in the health, production, and reproduction of the dairy animal. One of these has come into the feeding picture. The thyroid gland produces a substance which regulates the metabolism or burning of nutrients in the body. The hormone which it produces contains iodine, and this seems to be the principal reason that animals require iodine.

If iodine is lacking in the diet, the thyroid gland, located in the neck, becomes enlarged, causing goitre. When the hormone is fed to dairy cattle, it causes them to increase the rate of using up their nutrients. Milking cows, past their peak production, usually increase sharply in production when the hormone is fed.

A procedure has been worked out for making a synthetic hormone by combining iodine with casein. This synthetic thyroid hormone is sold for feeding to dairy cows under a trade name. This drug has no food value, but acts purely as a stimulant. Unless fed heavily on good feeds, cows will lose weight rapidly if fed the hormone. Until a cow reaches the point where increased feed will not increase production, there is no point in feeding thyroprotein. If it is to be fed, judgment should be used. The following suggestions are made:

Feeding trials have shown thyroprotein to be most effective when fed to cows from about forty days after calving to about the sixth month of pregnancy.

It is usually more effective for older cows than for young cows.

It is probably less effective when cows are grazing lush pasture.

More feed, up to 25 per cent above Morrison's standards, is required to prevent loss in body weight.

It is not recommended for use during hot weather.

If thyroprotein is fed, recommendations for feeding should be followed carefully, because excessive dosages will cause serious disturbances in the cow, and under-feeding will not produce expected results.

Under present rules it cannot be fed to cows under advanced registry or breed herd test.

Stilbestrol, a synthetic female hormone, is being used extensively in feeding meat animals, but at present there is no indication of benefits to dairy cows.

14. Urea for Dairy Cattle

Research at the University of Wisconsin and elsewhere has indicated that certain non-protein substances containing nitrogen may be used to a limited extent as a substitute for protein in feeding the ruminants or cud chewing animals (cattle, sheep and goats). One of these which has been found satisfactory, if properly used, is urea. Some commercial feeds offered to dairymen contain urea as a source of protein.

If used in too large amounts, urea is harmful to the animals, even to the extent of causing death. It is recommended that not more than 3 pounds of urea be used in each 100 pounds of grain mix or concentrate as it is fed, and that this be mixed very thoroughly to distribute the urea evenly. If it is stated on the tag or label that 8.6 per cent or less of the protein value guaranteed is in the form of urea, the feed contains less than 3 pounds of urea per 100 pounds of feed.

If urea is used in a commercial feed, this fact must be stated on the tag or label, and the part of the guaranteed protein value which is in the form of urea should also be stated.

If urea is used in too large amounts, the animals may object to the taste and may not eat the feed readily.

The use of urea is purely a matter of economy. It does not make the feed better in any respect than a feed of equal protein value without urea. There may be a question whether it is fully as good under all conditions.

The feed containing urea should sell at a lower price than one of equal protein value without urea. If it does not sell at a lower price, there is little reason to purchase it.

Feeds containing urea should not be used for hogs, horses, poultry, or small calves.

Urea will not usually be used efficiently in a ration already high in protein.

15. Toxic Feeds, Feed Poisoning

Feeds eaten by the cow may cause harmful effects or even death.

Many poisonous weeds or plants may grow in pastures and may cause sickness or death if eaten in large amounts. Some of the more common are water hemlock, white snakeroot, some of the milkweeds, horsetail and other rushes, the nightshades, and the bracken fern. Usually they give trouble only if the pasture is so poor that the animals are forced to eat weeds which they would ordinarily avoid. The remedy is to control weeds and provide good pasture. Usually areas where this cannot be done produce little feed, and the best answer may be to fence the animals out.

Ergot, a fungus disease of the seeds of cereals and grasses, may cause very serious trouble. This is most

commonly found in rye. It appears as long blackened kernels. Grains containing noticeable amounts of ergot should not be fed to dairy cattle. Moldy feeds are not relished by the cow, but if eaten they are seldom harmful. Badly spoiled feeds, particularly those high in protein, may cause botulism similar to food poisoning in humans.

Sweet clover hay, particularly if moldy or musty, may cause the blood of animals to which it is fed to lose its clotting power. Such animals may bleed to death from small scratches, or they may bleed internally.

Soybean meal from which the oil has been extracted with trichloroethylene has been associated with a similar bleeding which caused heavy losses in a few individual herds. Most of the soybean meal is prepared by other processes and is a safe and excellent feed.

Acorns are relished by cows but milk production may suffer when they are eaten in large amounts. Milking cows should be kept out of pastures containing oak trees when acorns are falling.

16. Poisoning from Extraneous Materials

Lead, usually from paints, causes heavy losses. Paint used on barns, lot fences, or equipment should be lead free. Old paint pails should never be left where cattle may lick them.

Spray residues may be a hazard. It is not safe to graze orchards sprayed heavily with poisons such as lead arsenate. Many of the newer insecticides are very toxic. When used on crops that are fed to milking cows, residues may appear in the milk. Since no residues are permitted in milk, dairymen should take every precaution in using feeds that have been sprayed. Some insecticides may be used directly as systemics by feeding or applying on the animal to control parasites. These

also involve a risk of residues in milk. Before using for milking cows, make certain that such drugs have been approved and that they are used strictly as directed.

Regardless of how they occur, the milk producer is responsible if insecticide residues are found in the milk, and he may be prosecuted for violation. The county agricultural agent can usually supply the latest information on this problem.

The chlorates used for killing weeds may kill cattle. Nitrate fertilizers are also poisonous. These materials should never be stored where cattle may lick them, and should be used with care in pastures during the grazing season. Empty bags should be burned or buried. Cattle do not appear to be harmed by 2-4-D as ordinarily used.

Heavy losses are caused by injuries from nails, baling wire, and other sharp objects which the cow may get in her feed. This is sometimes called "hardware disease." Care must be taken in cutting bale ties, and all wire should be kept where it cannot get into the hay, silage or concentrates. Small permanent magnets are now available which help prevent "hardware disease" when placed in the stomach with a balling gun.

17. Feeds and Milk Flavor and Quality

The flavor or odor of many feeds may be transmitted to milk. The flavor of good milk includes the mild and pleasing flavors imparted by ordinary feeds. Any strong or abnormal feed flavors in milk or milk products are very objectionable.

Many weeds may cause off flavors. Wild onions or garlic are among the worst. Onion or garlic infested pastures should be used for heifers and dry cows only. Onion flavored milk from one cow may spoil an entire vat of milk or cream. The Frenchweed or penny plant

may also cause serious trouble. Other members of the mustard family, including pepper grass, have been blamed. If cows are forced to eat large amounts of ragweed, the milk may become very bitter.

Cabbage, rape, and turnips may affect the milk flavor. Such feeds should be fed after milking so the cows may have several hours in which to eliminate these off flavors before the next milking.

Silage may cause off flavors. If so, it should be fed after milking.

The milk sometimes has a "grassy" flavor when the cows first go on pasture. This usually disappears within a few days.

In addition to such feed flavors which reach the milk through the animal's body, flavors and odors may be picked up by milk after it has been drawn. Milk should not be handled in open containers in barns where feed odors are bad. Milk flavors can also result from cows breathing strong odors. Good ventilation and care in handling smelly feeds such as silage will help to prevent this trouble.

Cheese makers, particularly those manufacturing Swiss cheese, often object to feeding silage. They claim it affects the fermentation or ripening of the cheese. This may be largely due to contamination of the milk with silage-fermenting bacteria as a result of silage material that gets into the milk through careless handling.

18. Balancing the Dairy Ration

With the background information of this chapter and other information you should now be ready to balance the feeding ration so as to get the best returns from the dairy herd.

In balancing a dairy ration you, as a dairyman, will need to give special consideration to two things. First, what are the different combinations of feeds that will

give you good milk production and continue to maintain the health of the herd? Second, what are the prices of these different feeds? When will it pay you to shift from one feed to another? For example, if you are feeding ground corn and the price of it goes up it may pay you to shift to barley or even wheat or rye. Either one is a satisfactory grain feed. Again, suppose you are feeding linseed meal and the price of it goes up, you may want to replace it with some other feed rich in protein such as soybean oil meal or cottonseed meal.

Practically all the State Colleges of Agriculture have publications on how to balance the dairy ration. The publications usually place emphasis on the farm grown feeds which are grown abundantly in their states.

Depend on roughage—Much is said about the use of concentrates in balancing a dairy ration. However, it is most important that the dairy make money. Good dairymen depend on roughage to supply *nutrient* rather than high-priced concentrates.

Feed best roughage to producing cows—It is a desirable practice to feed the highest quality roughage to the milking cows and let the growing stock pick over what remains. If roughage is poor, rather than balance with concentrates it may be more profitable to buy better quality roughage.

Have a variety of roughage—Cows will do better if more than one source of roughage is available. Grass, silage, dry hay and green chop is a good mixture. Five pounds of dry hay is a minimum.

Here are the steps necessary to get a well-balanced ration. First the concentrate feeds are divided into groups, based upon the amount of protein they contain. You can divide the concentrates into four groups, A, B, C, and D.

A FEEDS		B FEEDS	
Farm grown grains—low in protein		Medium in protein	
ground corn	ground barley	wheat bran	wheat middlings
corn-and-cob meal	ground wheat	16% dairy feed	
ground oats	ground rye		
C FEEDS		D FEEDS	
		Rich in protein	
corn gluten feed	24% dairy feed	linseed meal	cottonseed meal
dried brewers' grains	24% peanut meal	soybean oil meal	41% peanut meal
Malt sprouts	distillers' dried grains	ground soybeans	32-34% dairy feed
		corn gluten meal	

The authors of Wis. Circular on "Feeding the Dairy Herd" divide roughages and pasture into three groups:

1. Above average roughages or good pasture.
2. Average roughage or fair pasture.
3. Below average roughage or poor pasture.

You have to decide which class of roughage you are feeding—above average, average, or below average.

Then select a feed mixture under this roughage class. Your choice will be determined by the feeds you have on hand and by those you can get. See groups of feeds A, B, C, D, just discussed.

When feed of any group is called for, one or more may be used. If possible, use three or more feeds in your mixture. Suppose you have average roughage and have corn and oats, feeds of Group "(A)." Suppose you can get linseed meal, one of the feeds in Group "(D)." These will fit the No. 5 mix (under average roughage). You can make up a batch: 800 pounds corn and oats, 200 pounds linseed meal.

Here are the three feed combinations you can use:
If you have above average roughage or good pasture

or good leafy alfalfa, soybean or choice clover hay fed with corn silage, then use any of these four mixes:

Mix No. 1
900 lbs. _____ A feed
100 lbs. _____ D feed

Mix No. 3
800 lbs. _____ A feed
200 lbs. _____ C feed

Mix No. 2
850 lbs. _____ A feed
100 lbs. _____ B feed
50 lbs. _____ D feed

Mix No. 4
500 lbs. _____ A feed
500 lbs. _____ B feed

If you have average roughage or fair pasture or good mixed hay or fair legume hay fed with or without corn silage, then use any of these four mixes:

Mix No. 5
800 lbs. _____ A feed
200 lbs. _____ D feed

Mix No. 7
650 lbs. _____ A feed
350 lbs. _____ C feed

Mix No. 6
700 lbs. _____ A feed
100 lbs. _____ B feed
100 lbs. _____ C feed
100 lbs. _____ D feed

Mix No. 8
Straight 16% dairy feed

If you have below average roughage or poor pasture or timothy or other grass hay fed with or without corn silage, then use any of these four mixes:

Mix No. 9
700 lbs. _____ A feed
300 lbs. _____ D feed

Mix No. 11
600 lbs. _____ A feed
100 lbs. _____ B feed
100 lbs. _____ C feed
200 lbs. _____ D feed

Mix No. 10
600 lbs. _____ A feed
200 lbs. _____ C feed
200 lbs. _____ D feed

Mix No. 12
450 lbs. _____ A feed
200 lbs. _____ B feed
200 lbs. _____ C feed
150 lbs. _____ D feed

You will notice that you use *more* of the feeds rich in protein when you have below average roughage or poor pasture. That helps give a properly balanced dairy ration. (Adopted from Wis. special circular, *Feeding the Dairy Herd.*)

19. Feed Grain According to Production

A given amount of grain will go farther if fed to each cow according to her production. Heavy producers need more than low producers. With average roughage, feed Holstein cows about one pound of grain for each four pounds (two quarts) of milk produced daily; Guernseys and Jerseys one pound of grain for three pounds (one and one-half quarts) of milk; and Brown Swiss about one pound of grain for three and one-half pounds of milk. With roughage above average, less grain may be fed, while with below average roughage, more may be required.

When good roughages are fed liberally, concentrates may be saved by feeding no grain to Holstein cows producing below 15 or 20 pounds of milk per day, or to Guernseys and Jerseys producing below 15 or 20 pounds—provided the cows are not in thin flesh.

It is very expensive to improve poor roughages with grain. It doesn't pay to feed poor roughage.

20. Looking for Best Buys

Buy on quality—Hay and other roughage should be purchased according to quality.

Handle in bulk—Green chop and pellets lend themselves well to bulk handling and mechanical feeding.

Use wafers—One of the new advances in cattle feeding is the use of pellets or wafers. Wafers may be three to six inches in diameter and one-half inch thick. Not only do they lend themselves to complete mechanization, but the quality of feed is often higher and there is little loss in feeding from leaf shatter.

21. General Rules for Feeding the Dairy Herd

A dairyman has to use his judgment in many cases. He can't follow rules rigidly but there are a number

of general rules that it will pay him to observe. Here are seven general rules suggested by Professors Sleeter Bull and W. E. Carroll in their book on *Principles of Feeding Farm Animals*:

1. For growing heifers, feed one-third to one-quarter pound of concentrates (the same mixture as used for milk cows is excellent) daily per 100 pounds live weight and legume roughage at will.
2. For dry cows, feed 20 pounds of corn silage a head and other roughage at will, or four pounds of concentrates and roughage at will, or run on pasture.
3. For milk cows, feed about two pounds of legume hay or 1 pound of legume hay and three pounds of corn silage daily per 100 pounds of live weight together with the amount of concentrates prescribed in Rule 4, 5, or 7.
4. For milk cows producing high test milk, feed one pound of concentrates daily for every two and one-half to three pounds of milk produced daily, together with roughage as prescribed in Rule 3.
5. For milk cows producing low test milk, feed one pound of concentrates daily for every four pounds of milk produced daily, together with roughage as prescribed in Rule 3.
6. On good pasture, feed one pound of concentrates for every five to six pounds of milk for good producers.
7. Feed one pound of concentrates daily for every pound of butter fat produced in a week, together with roughage as prescribed in Rule 3.

Cows eat their weight—Another good rule many dairymen employ in determining the amount of hay dairy cows eat is: A cow will eat her weight per month. Therefore, a 1200 pound cow would eat 1200 pounds of hay per month.

In the preparation of this chapter many sources of information have been drawn on freely. Information in bulletins and circulars from the colleges and universities have been used extensively. Where they have been quoted the exact reference has been cited.

Some Important References for Chapter

U. S. Farmers' Bulletins No. 956, 1617

Ohio Bulletins No. 448, 497, 538, 540, 552

U. S. Tech. Bulletin 739

Ind. Exp. Station Bulletins No. 178, 183, 191, and 245

Illinois Bulletins No. 316, 369

Wis. Exp. Station Bulletins No. 102, 323, 362, 373
and 338; Wis. Cir. 467

Approved Practices in Feeds and Feeding, D. W.
Cassard, The Interstate Publishers, Danville,
Illinois

CHAPTER VII

CONTROLLING PARASITES AND DISEASES

Proper health essential—Prevention and control of parasites and diseases is an important item in all livestock production as this is one of the significant ways in which production costs can be lowered. With dairy cattle, this problem becomes even more important because of the public health factor. Several of the diseases that affect dairy cattle with resultant financial loss from the production standpoint also are transmittable to people. Therefore, it is of utmost importance that dairymen follow approved practices in preventing and controlling parasites and diseases. Following is a list of disease conditions most likely to be encountered by the average dairyman.

Suggested Activities Which Involve Approved Practices

1. Providing an adequate sanitation and prevention program.
2. Preventing bloat.
3. Choke.
4. Controlling parasites:
 - Worms.
 - Flies.
 - Lice.
 - Cattle grub.
5. Controlling reproductive diseases:
 - Bangs.
 - Trichomoniasis.
 - Leptospirosis
 - Other reproductive troubles.
6. Controlling mastitis.
7. Controlling milk fever.

8. Controlling shipping fever.
9. Controlling foot rot.
10. Controlling anaplasmosis.
11. Other serious diseases.

1. Providing an Adequate Sanitation and Prevention Program

Practice sanitation—The importance of cleanliness on a dairy cannot be overemphasized. Not only are most of the ordinary livestock sanitation problems encountered, but in addition the presence of spilt milk constitutes an extra danger, as disease germs, flies, etc., readily multiply on milk. Proper cleaning removes most of the germs and parasites along with the dirt. The remaining germs are so few in number and weakened so as to be harmless under ordinary conditions. An abundant supply of water under good pressure is the easiest and most effective way to clean most milking parlors and areas that are cleaned daily. Whenever needed, the correct disinfectant properly applied will go a long way towards eliminating dangers from germs and parasites.

Utilize sunshine—Direct rays from the sun are one of the most effective germ killers known while still being entirely safe to use. Therefore, pens and equipment should be so arranged as to take full advantage of this beneficial factor.

Provide safe pastures—Because dairy cattle are handled more often and generally crowded onto smaller pastures and quarters than beef or sheep, they have a great disease potential. Therefore, it is most desirable that the pastures used be clean and disease free. If this be true, they then should be utilized to the fullest advantage, as cattle are always in the healthiest spot when grazing a well-managed pasture. Pastures should be well drained and free from bogs. Any dangerous areas, whether from poisonous plants, toxic soil condi-



Fig. 7-1—An inexpensive sprayer like this can be used to kill small patches of weeds that would flavor milk.

tions, or disease germs, should be corrected immediately or fenced off. Special care should be given to drainage in irrigated pastures, as internal parasites are especially numerous on pastures that are damp the year round. Keep pasture grasses relatively high through proper management so mechanical objects will not be swallowed.

Watch for milk flavoring—Milk flavoring is not a disease problem. However, from the economic standpoint, it is just as costly. Milk readily picks up flavors from many different sources; some dairymen report even green alfalfa may flavor milk enough to be objectionable when used for Grade A milk. Odors from petroleum products, for example, stored too close to milk may become absorbed by the milk and lower its value. Extreme watchfulness should be exercised in finding and eliminating noxious plants, such as ragweed, in the pasture so that cows cannot graze them and thereby lower milk value because of objectionable odor and flavor.

Eliminate hazards—Old wire, nails in corrals, deep holes, gates in need of repair, and numerous other items around the farm are a constant source of injury

and common beginning of infection. It is a desirable practice to eliminate all such danger zones on dairies.

Prevent slippage—Special precautions should be taken to prevent falls and possible udder injury to cows. Concrete should be roughened, cleats provided on ramps, floors sanded if necessary, or any other practices used that will prevent cows from falling on slippery floors. Doors should be wider than average so cattle cannot crowd one another and injure hips or udders. High sills that the cows must step over are absolutely taboo on the well-planned dairy, as large udders can easily be damaged.

Keep animals healthy—Contented healthy animals are more apt to ward off disease germs or pests and recover more quickly in the event they do become ill. Farmer's Bulletin 1991 states that the healthy animal is able to resist invasion by considerable numbers of germs. Properly fed cattle are not so apt to eat poisonous plants or have unusual cravings. If fields are not over grazed, cattle do not have to eat as close to the ground where they can pick up nails or other foreign objects which may cause death.

Separate sick cattle—In order to prevent spread to other stock in the herd, any sick animal should be immediately separated from all contact with other cattle. It is also more convenient to treat sick stock under these conditions. They should not be returned to the herd until they have recovered and the trouble eliminated or else determined that it is non-contagious.

Watch digestion—Orderly bowel movements of cattle are a good indication of normal health. Therefore, any unusual signs in the stool or feces should be examined for possible cause. Too much concentrates, spoiled feed, dirty bins, lack of water, minerals, etc., can cause cows to go "off" feed.

Reduce concentrates—Most of the time any ill condition will respond favorably if concentrates are reduced. Oftentimes a laxative drench will help. Epsom salts is usually in order and effective. A bottle placed in the side of the mouth will do the trick.

Destroy dead carcasses—All dead animals, regardless of cause of death, should be buried deep enough so dogs or other animals cannot dig them up. If available, notify the tallow works and they will take the carcass away with no trouble to the owner. Afterbirth and other such material capable of harboring germs should be burned or deeply buried.

2. Preventing Bloat

Bloat, the overdistention of the first two stomachs with gas, is a serious problem in dairy cattle production. It offers a real obstacle in the pasturing of legumes, such as clover and alfalfa. Therefore, the danger in dairy production is increased where permanent pastures are used to such an extent. Bloat occurs on several other succulent feeds including roots and tubers although not as often. Occasionally, an individual cow will bloat on any type of ration.

Supply coarse roughage—According to University of California Bulletin 662, bloat results from a dietary lack of sufficient fiber of proper type to initiate belching. Therefore, dry hay, straw, or other types of coarse stemmy feeds should be available to cows at all times, especially if they are on succulent legume pasture.

Put dry hay in pasture—If cattle are on pasture it is useless to have the dry hay in the barn. Therefore, coarse roughage should be available to cattle where they are grazing so they do not have to travel to get it.

Plant grasses with legumes—It is a desirable practice to plant grasses with legumes in a pasture. Bloat is seldom a problem if pastures are at least 50 per cent grasses.

Withhold hungry cattle from succulent feed—Be sure cattle are full of hay before turning them onto pasture so they will not be too greedy and gorge themselves on succulent feed. It is also desirable to get the cows accustomed to pasture. If they are grazed con-



Fig. 7-2—Losing a valuable cow like this from bloat is costly for a dairy farmer. There are many approved practices to employ which can reduce losses from bloat.

tinuously on succulent feeds, they are not so apt to overeat as if they are turned in occasionally.

Graze only during day—This practice is seldom used once the cows become accustomed to succulent feeds. However, if they continue to bloat it may become necessary to feed them hay at night and graze them only during the day so they can be closely watched.

Keep animals on their feet—Should animals become severely bloated every attempt should be made to prevent their lying down. A good practice is to place the animals in a loading chute so as to support them and raise their front end thus relieving gas pressure on the diaphragm and vital organs. In addition, they should be kept moving until the excess gas is expelled by belching. A home remedy for arresting bloat is two ounces of turpentine in a quart of *raw* linseed oil. Never used boiled linseed oil. The benefits of such agents are due to their surface tension-defoaming-action. Methyl silicone, a defoaming agent, is also effective. Some

ranchers spray peanut oil on the pasture strip to be grazed—3 oz. per cow per day.

Many ranchers tie a gag in the mouth of the animal to initiate belching. The gag may be made of an old shovel handle 10 to 12 inches long.

Call a veterinarian—According to the 1956 Yearbook of Agriculture, in a severe case of hloat, puncturing the paunch with a trocar may be necessary. This operation may injure the animal critically if not done properly, and should be performed by a qualified veterinarian whenever possible. However, time is an important factor if an animal is down and generally it is necessary for the rancher to do it himself. Be sure to cut high up on the side. The cut will often heal satisfactorily, although it is hard on milk production for several weeks. In any case, puncturing the paunch should be a last resort.

3. Choke

Importance—Choke itself is not particularly dangerous; however, it may lead to bloat with eventual loss of the animal. Many dairymen may never experience cases of choke; however, with those that feed tubers or roots it may be a fairly common problem.

Cause—Choke in cattle is caused by an attempt to swallow large objects without thoroughly chewing them. Such food materials as beet tops, ears of corn, potatoes, and various root crops are the principal causes of choke, although foreign objects may occasionally be responsible.

Symptoms—The symptoms in most cases are quite alarming, but sudden death seldom occurs. However, restlessness, salivation, retching, forced swallowing movements, and eventual bloating are indicative of choke.

Control measures—The object may sometimes dis-

edge in one or two days without mechanical assistance of any kind. Rough procedures like trying to crush the object between two bricks should not be used. Rather, if the object is an article of food lodged in the neck portion of the esophagus, it should be forced upwards as gently as possible to the pharynx at the back of the mouth cavity by placing a hand on either side of the neck along the jugular furrow and pressing upwards against the object. If the object is lower down in the throat, it should be forced on down into the rumen. This can best be done with a flexible stomach tube about $1\frac{1}{2}$ inches in diameter which has a wooden probang inserted in the end. It should first be lubricated with linseed oil. If neither of these procedures gives results, a veterinarian should be called.

4. Controlling Parasites

Not only are parasites responsible for lowering vitality and a hindrance to normal growth and production of livestock in the dairy business, but they are very annoying to people as well.

Worms

Importance—In dry climates or under range conditions, internal parasites cause little trouble to most herds. However, with the advent of permanent pastures, irrigated pastures and cattle raised in damp climates, worms are becoming more and more significant. The danger is particularly alarming because the economic drain from internal parasites is slow and constant. Death occurs but not frequently. Often the infestation is present and unknown to dairymen. Therefore all producers should make certain their livestock are free from worms.

Cause—Worms are internal parasites. They are often present in great numbers and vary tremendously in size. Under normal conditions enormous numbers of

eggs are produced which develop into larvae that are picked up by grazing cattle. Young animals are most often infested as cattle seem to become immune with age.

Symptoms—General weakness and anemia together with a loss of weight is evident in affected animals. Calves and yearlings are most often affected. The hair appears rough while the skin and mucus membranes are pale. Animals often develop a "pot belly," and in the later stages swellings may appear under the jaw. This is commonly called "bottle jaw."

Control—Pastures should be well drained and whenever possible, all mudholes and permanent waterholes eliminated. Pasture rotation is helpful, but according to C-222, Texas A&M, no practical scheme of pasture rotation has yet been found that will eliminate all parasites. The youngest animals should be placed on the cleanest, driest pastures until they are at least 6 and preferably 12 months old. Weaning is the critical period for calves. Therefore calves affected should be treated at this time.

Following are some suggestions that will assist in controlling worms:

1. Eliminate mudholes.
2. Feed animals well; keep them thrifty and growing.
3. Do not graze pastures too short; keep grasses tall so cattle do not eat off the ground.
4. Observe calves carefully especially at weaning.
5. Treat affected animals with an effective anti-worm compound. Many compounds are known but phenothiazine has given especially good results. Do not starve animals before or after treatment but use caution as all anti-worm compounds are dangerous.

Phenothiazine Dosages

(These dosages below are based on one fluid ounce of drench containing 10 to 12 grams of phenothiazine powder.)

Wt. of animal in pounds	Amt. of drench (ounce)	Period of treatment
200	2	Repeat dosage every 16 or 21 days where heavy infection oc- curs.
300	3	
400	4	
500 and over	5	

Weak anemic calves should be given half a dose, repeated in 7 to 10 days. In no case should any one animal receive more than 60 grams or two ounces of powder regardless of how given.

Use a four-ounce drench syringe to administer.

Commercial phenothiazine can be easily purchased and satisfactorily used. Be sure to follow manufacturer's directions exactly.

Flies

Importance—Flies are a nuisance around the dairy not only to cows and attendants, but because they are a source of contamination to the milk and possible spreaders of disease from germs sticking to their feet.

Cause—There are three species of flies commonly found around dairy premises—the housefly, stable fly, and the hornfly. All species are troublesome because of their annoying habits and the stable fly has biting and blood feeding habits. Lack of cleanliness is the major cause of fly-breeding.

Control measure—Any measure utilizing a chemical control must be carefully analyzed because it may find its way into the milk and therefore be a potential danger of poisoning humans. In view of this, the first control to use is to do everything possible to keep the population of flies down.

Eliminate filth—All flies breed in filth; therefore, floors, runways, etc., should be kept clean. Spilt milk should be immediately washed out so flies will not lay eggs. Absolute cleanliness is a necessity.

Protect manure—Liquid manure is best flushed into a covered retainer or washed into the irrigation water and spread on the land. Whenever possible it should be put on farm land as it may carry worm eggs and cows will drink from pools in pasture. Solid manure should be protected in a fly-proof pit or screened-in shed.

Dust floors—In feed lot areas where dry stock and young cattle are being kept, Oklahoma A. & M. recommends scattering BHC over the floors and alleys as a supplement to spraying. One application of 4 pounds of BHC, 10-12 per cent gamma, on the dirt floor of a 36x60 foot feeding shed helped keep the fly population down for a week or more.

Suspend treated rope—A six-foot length of rope soaking in a 20 per cent lindane emulsion and suspended from the rafters of a fly infested barn is an effective way of killing flies for about a month.

Use recommended chemical sprays—New and rapid developments in insect killers make it almost impossible to single out one product. Not only must the product be capable of killing flies efficiently, but it must also be harmless to stock, safe from the public health standpoint, and not flavor the milk. At present, Methoxychlor is considered a very excellent product for use in a dairy. Spreader sticker compounds have considerable value in making each application last longer and thus reduce number of sprayings. Local county agents can best advise on problems in a particular area and recommend up-to-date chemicals.

Lice

Importance—Young cattle and those in poor condition as a result of poor feeding and management are

especially affected and will, according to Michigan State Extension Folder F-12, give 10 to 15 per cent more milk when freed from lice.

Cause—Lice are very small external parasites that live on cattle by biting or sucking blood.

Symptoms—The first effects of lousiness are a scurfy skin and patches of falling hair, particularly around the head and neck, brisket and tail-head. If lice are not killed, the animal may lose much of its hair and develop sores over its entire body.

Control measures—Barns and stalls should be scrubbed out with a 10 per cent solution of creolin or other suitable disinfectants. The best remedy for killing all species of lice on cattle is a Derris powder compound containing at least 5 per cent rotenone. A good home-mix powder is:

1 pound Pyrethium, or Derris powder

3 pounds common flour

(add 3 ounces powder moth balls if blue lice are present)

Cattle Grub

Importance—Losses from cattle grub or heel fly amount to millions of dollars annually when considering the entire livestock industry. With dairy cows, the problem is not so acute because they are constantly under the watchfulness of the milkers. However, it is still a problem in many areas and particularly with yearling heifers being raised on range pastures.

Cause—Grubs are the result of eggs laid by the adult heel fly on the legs of cattle. Eggs are laid in the spring and the young larvae take about eight months to travel to the backs of cattle where they pierce the hide and mature. Then they drop to the ground and pupate into the adult fly.

Symptoms—The most obvious sign of heel flies is in the spring when cattle run in panic with their tails in

the air, or hide in the brush and refuse to eat. Oftentimes they will stand knee deep in water for hours at a time. Early in the year the grubs can be felt as bumps along the backs of cows when the area is rubbed.

Control measure—According to Oklahoma A&M Circular 470, rotenone is the only insecticide recommended for grub control. The best time to apply is when grubs are in the back. Large herds can be sprayed or dipped. However, dusting is the easiest procedure with dairy herds. Mix one pound of 5 per cent rotenone powder with two pounds of dusting sulfur and apply to the backs with a large shaker. Satisfactory ready mixed commercial powders can also be used. Rub the powder into the hair coat with the fingers. One pound of mix will treat four or five cows. Generally three treatments at 30-day intervals are sufficient if the first one is started as soon as the humps can be felt.

Systemic poisons are being perfected which promise to assist greatly in controlling grubs. These products are fed to cattle and the larvae of the grub is killed in the bloodstream. Check with your local veterinary supply house.

5. Controlling Reproductive Diseases

Diseases associated with the reproductive organs are very costly for the dairyman. Not only is the calf lost, but often the entire lactation period is eliminated or seriously reduced.

Bang's Disease

Importance—Bang's disease, or Brucellosis, is one of the most important dairy cattle diseases. There are heavy losses both in cash and through loss of calves. Cows infected with the disease produce about 20 per cent less milk than non-infected cows in the same herd, according to Farmer's Bulletin 1470. In addition, the disease is transmissible to humans in the form of undulant fever.

Cause—The disease is caused by bacterium *Brucella abortus*, although there are other closely related forms of organisms. Cows and heifers of breeding age are most commonly infected. Calves are very resistant until breeding age.

Symptoms—The act of aborting is the only easily recognized symptom and this is not absolute proof, as other things may cause abortion. Cows generally abort once and then seldom abort again. For this reason the disease may appear to come in cycles as a new crop of heifers is brought into production. Infection is generally through the mouth when cows lick the expelled fetus and membranes from another female that has just aborted.

Control measures—Drugs are of no value at present, therefore control measures must depend upon prevention. The program to follow also varies somewhat depending upon the degree of infection in the herd.

Suggested control measures:

a. Take a blood sample from each cow in the herd and have it tested for reactors. (A qualified veterinarian can best do this job.)

b. If only a few cows are reactors, they should be removed and sold for slaughter. On the other hand, if most of the herd are reactors, the owner may keep the infected animals until such time as new immune stock can be brought in and thus not upset the herd economy too greatly. In any event, the final goal should be complete removal of all reactors.

c. Practice sanitation and prevent clean animals from coming in contact with infected stock. Isolation of cows for a few days before and after calving is a desirable practice to prevent spread.

d. Purchase only stock that has been tested and proved not to be a reactor and preferably from a clean herd. Better yet raise your own replacements.

e. Vaccinate all calves, with the proper strain of vaccine, between the ages of five to eight months.

Trichomoniasis

Importance—Many dairymen have probably never heard of this disease, yet it is becoming widespread. The disease causes breeding trouble and early abortion in cows. Unlike Bang's disease, the bull can also become infected and spread the infection.

Cause—The infection is generally spread from an infected bull to a cow at the time of breeding. Trichomonad abortion and breeding trouble are actually caused by an exceedingly small organism, *Trichomonas foetus*.

Symptoms—According to Stencil Circular 249, University of Wisconsin, several symptoms may be noticed:

1. Heat periods become irregular and the animal fails to "get" with calf.

2. The animal may become pregnant but abort early, generally 4 to 16 weeks after the last breeding. Often the aborted fetus is so small as to be overlooked. After an abortion the cow usually comes in heat. This symptom may be the first to be noticed by the herdsman.

3. The cow may become pregnant, but the developing calf dies and is retained. Pregnancy may appear normal, but the result is only a pussy discharge toward the end of gestation.

4. Rarely does an infected cow calve normally.

5. A common symptom in a cow is the appearance of a whitish discharge two or three days after breeding by an infected bull.

Control measures—Diagnosis is difficult and unreliable so a veterinarian should be consulted if such breeding trouble occurs. The following program should be tried:



Courtesy Chas. Pfizer Co.

Fig. 7-3—A research technique—shows a bacteriologist removing stomach contents samples from a fistulated steer. The fistula, here, is a permanent one made of lucite and stainless steel. The stomach contents are then "kept alive" in a rumen bath and are used in evaluating the effect on rumen microflora of the addition of feed additives such as antibiotics, etc. Continuous research is needed to control diseases and improve feeding practices in the modern dairy herd.

1. The spread can be checked by slaughtering infected bulls.
2. Give all infected cows or the entire herd a breeding rest of about three months.
3. (a) Use artificial insemination from a clean bull, or (b) purchase a young clean bull. Breed heifers and clean cows first. When these animals are safely with calf, breed cows exposed to the disease. Slaughter the bull as soon as cows are settled.

Leptospirosis

This disease is of recent concern to the livestock industry and was originally described as a disease of man.

According to the 1956 Yearbook of Agriculture, leptospirosis can vary from a mild to severe infection which may be followed by death.

Cause—The cause is a microscopic parasite that has no surface covering. They have no flagella but move by a corkscrew motion of the freely moving ends. Entrance to the body is gained through abrasions in the skin or through mucous membranes like the mouth.

Symptoms—Fever and loss of appetite last for several days. Milk production drops or ceases and the milk becomes yellowish and colostrum like. Discoloration of the urine with blood varies from pink to red or black. Abortion may occur at any stage of pregnancy but usually the last one-third. Full-term calves may be dead or weak.

Control measures—Antibiotics like terramycin and dihydrostreptomycin appear to be of value. However, it is best to consult a veterinarian when the disease is suspected. If the disease is a problem it is best to vaccinate yearly or when buying cattle.

Other Reproductive Troubles

Dairymen should be particularly watchful for breeding troubles because breeding is such an important factor in the economy of milk production. *Vibrio fetus* is another disease that may cause abortion, although it is not as common as the others mentioned. Some breeders feel that spoiled, musty feed or even general undernourishment may cause cows to lose their calves prematurely. Not to be overlooked is the constant danger of mechanical abortion through outside rough treatment. Therefore, it is a desirable practice to handle cows gently at all times, especially when pregnant.

6. Controlling Mastitis

Importance—The total annual loss that results from reduced production, poor quality milk, and seriously

diseased cows is enormous. It is not unusual to find infectious mastitis in half the cows in large numbers of herds. Many dairymen would easily rate this as the most serious disease of dairy cattle at the present time.

Cause—Mastitis is an inflammation of the cow's udder caused by harmful bacteria. The disease spreads from one cow to another and gains entrance to the udder most easily when the teats or udder are bruised or injured. It can also spread from one cow to another via the milker's hands, contaminated bedding, or the milking machine.

Symptoms—Two types of mastitis are commonly encountered—acute and chronic. *Acute mastitis* appears very suddenly in quarters which were heretofore normal. The affected quarter is hot, swollen, painful, and often gives only a small amount of brownish-gray watery fluid. The cow is generally visibly sick and off feed. Death can result, the quarter may be lost, or recovery to normal milk flow can happen. *Chronic mastitis* affects the cow over a period of months or years, and is a constant threat to the entire herd. The majority of cows affected show recurrent attacks every few weeks. However, the cow seldom appears ill herself. Quarters so affected may appear normal, although there usually is swelling and hard areas near the base of the teat. Over a period of time, quarters may become shrunken and the end result may be one or more quarters completely dry.

Control measures—The important thing to remember is that the disease spreads most often from one infected cow to a clean cow through ordinary handling practices, such as milking. University of Wisconsin Circular 288 suggests the following as an aid in controlling mastitis:

1. Detect cows with mastitis—Daily use of the strip cup on the first squirt of milk from each quarter will indicate possible mastitis if clots or flaky milk are pres-

ent. Best procedure is to have the entire herd tested by a qualified person, such as a veterinarian.

2. Segregate infected cows—If adequate tests showed only one or two cows had the disease, the best procedure is to dispose of them so as to eliminate the source of infection. On the other hand, if enough cows in the herd are infected so that the economy would be greatly upset, then the milking order should be heifers first, normal cows second, and cows with mastitis last. Sterilize milking machine twice a day. The common practice of sterilizing once a day defeats the benefits from this milking order.

3. Buy only heifers for replacement—Better yet, raise all replacements.

4. Prevent all udder injuries—High sills, improper stalls, etc., are asking for trouble.

5. Practice sanitation and special care—Follow manufacturer's directions carefully when using disinfecting solutions.

- a. Disinfect milking machine between milkings.
- b. Dip teats after milking to keep off flies.
- c. Wipe off udder before milking. (Using disinfecting solution).
- d. Milk cows regularly, rapidly, and thoroughly.
- e. Milk cows with acute mastitis four to six times a day if possible.
- f. If cow is not too valuable send to butcher.
- g. Reduce concentrates.

Treatment—Good management and sanitation must accompany any treatment. U.S.D.A. Yearbook (1956) says the main agents for treating mastitis are the sulfonamides, nitrofurazone and the antibiotics. Combinations of products are used because no one drug is effective against all organisms. Many of the antibiotics are available commercially in various vehicles such as ointments. The material should stay in the udder 24 to

48 hours. A veterinarian should be consulted until the dairyman is familiar with treatment.

7. Controlling Milk Fever

Importance—To many dairymen, milk fever is unimportant. It is of interest though because high producing cows are especially subject to it. Therefore, those contemplating breeding toward high production should be alert for this trouble.

Cause—The disease is always accompanied by a marked shortage of calcium in the blood together with an unbalanced condition of other minerals. Therefore, it is most prevalent at calving when the rapid flow of milk begins to drain the blood of essential minerals.

Symptoms—High producing cows that have had three or four calves are most susceptible, although it may happen to any cow and even before calving. The animal has a staggering gait and lack of control of the hind quarters. As the disease progresses the cow goes down in a stupor, lying in a normal position except that her head is usually turned to her flank. Paralysis may become general.

Prevention—No positive method of controlling milk fever has been determined as yet. J. M. Boda and H. H. Cole, University of California, Davis, found that cows fed a low calcium diet during the dry period were in good shape to meet increased calcium demands after freshening. This phenomenon is associated with the parathyroid gland. They found the number of cases of milk fever in a herd considerably reduced if the cows were fed the following ration during the dry period: Ground barley 800; rolled barley 600; wheat bran 1500; cottonseed meal 100; monosodium phosphate 40; and salt 10 pounds, fed for six weeks before freshening plus eight pounds of oat hay or poor hay per day.

Control measures—There is no positive control or

prevention known, but treatment gives good results. A veterinarian can best give the treatment, although many dairymen have trained themselves to be ready to administer one of the following:

1. An intravenous injection of a solution of calcium gluconate. This is the most common, rapid and effective treatment.
2. Inflate each quarter with air which has been filtered so as to eliminate infection. According to Farmer's Bulletin 1470, every dairyman should keep a milk fever outfit on hand for quick use. These can be purchased in any large livestock supply house. The teats should be taped to prevent air escape. If no relief is evident in two hours, the treatment should be repeated.

8. Controlling Shipping Fever

Importance—Shipping fever, or stockyard fever, is an infectious disease of cattle usually attended with a high mortality. The disease is general, but probably not as common in dairy cattle as beef cattle because dairy cattle are not shipped in large numbers for long distances as are beef cattle. Shipping, however, is only one of many conditions in which cattle are subject to become infected.

Cause—The medical name "hemorrhagic septicemia" was given because it is a poisoning of the blood. The actual causative germ is still somewhat in question, although *Pasturella bovis septica* is present in animals with the disease. Some researchers believe a virus and bacterium are responsible. In any event, the disease most often strikes when the stock have gone through some hardship such as a long truck ride, undue exposure to weather, or general low vitality.

Symptoms—The disease develops rapidly and lasts from two to eight days or longer. High temperature, 104-107° F., accompanied by loss of appetite, occasional

coughing, and watery discharge is characteristic. Weakness and diarrhea follow. Animals may develop pneumonia and die in 48 to 72 hours. Some animals recover.

Control measure—Many preventative measures could be enumerated; however, all revolve around eliminating hardship for the livestock.

Some suggested precautions to follow are:

1. Avoid hard driving in the case of range raised heifers. Allow time for rest and load quietly.
2. Avoid over-crowding in cars and trucks. Cool or insulate as climate demands.
3. Feed and water at proper intervals. Check often to see that no cattle are down.
4. Cows in milk should have an attendant.
5. Do not make sudden changes in feed. Supply a non-legume hay.
6. Upon arrival, withhold water at first, but supply ample dry roughage.
7. Segregate diseased animals.

The use of biological products is still in question. Therefore, their administration should be left to a competent veterinarian. However, many livestock producers feel the use of biological products to prevent shipping fever is justified if given several weeks prior to shipment.

9. Controlling Foot Rot

Importance—Foot Rot or Foul Foot is rather common in dairy herds. The disease causes a great reduction in milk flow as well as rapid loss of weight.

Cause—Apparently one or more micro-organisms are responsible for the disease but authorities have not yet agreed upon the exact germ or germs. Old boards with nails protruding, rusty wires, and other sharp objects that cows can cut themselves on will give the germs a chance to enter and cause infection.

Symptoms—The hind feet are the most likely to be affected. Cattle become sore-footed and the infected foot becomes swollen and foul smelling; occasionally the infection will be under the horny part of the foot and not readily detectable. Joints may eventually become afflicted if the disease is not arrested.

Control measures—According to Iowa Extension Bulletin, page 99, Foot Rot can be readily cleared up by the following procedures:

1. Corrals and loafing sheds should be kept as dry as possible; take particular care around water troughs and feed racks to keep the area dry by spreading gravel or paving. Trouble comes most often from permanent mud holes. It is a desirable practice to clean them up or fence off trouble spots.

2. Eliminate all rusty nails, broken glass, etc., from pens so that feet will not become injured.

3. See that the animal's feet are properly trimmed.

4. If foot rot becomes an ever present problem fix a shallow vat or tank where cattle must stand when eating or drinking. The tank should contain a saturated solution of copper sulfate. Some dairymen recommend a bandage soaked in a disinfectant.

5. In severe cases, consult a veterinarian, as sulfa injections frequently give good results. Many dairymen report rapid cures and almost 100 per cent effective control using sulfa injections.

10. Controlling Anaplasmosis

Importance—This disease is a relatively newcomer to the dairy industry. However, there are indications it may become widespread and be a real factor in the economy of livestock production. It is characterized by a marked anemia and depression. According to the 1956 Yearbook of Agriculture, it is fatal in 25 to 60 per cent of all cases. Recovered animals become carriers and, as yet, there is no certain cure or preventative.

Cause—Anaplasmosis is an infectious disease caused by a minute parasite which invades the red blood cells and destroys them so that the red blood becomes pale and watery. Ticks, horse-flies, and mosquitoes carry the parasites from infected to healthy animals under natural conditions. However, unclean surgical instruments used in such practices as dehorning, can transmit the infection.

Symptoms—There are many symptoms, and diagnosis must be made by a competent veterinarian. However, the following are a few common characteristics: A marked depression, tremors of the muscles, loss of appetite, and a great reduction in milk flow. Constipation is usually evident. The skin, teats, udder, whites of eyeballs, and all visible membranes become pale and yellow. Eating of bones or dirt is not uncommon. Dribbling urination is evidenced, but urine is normal color. Death may follow in one or two days. Recovery is slow for the animals that survive.

Control measures—

1. Sick animals should be kept in the shade, given plenty of clean water, little appetizing green feed, and protection against flies and mosquitoes. Good nursing is vital.

2. Unless widespread, all animals that recover should be fattened and slaughtered.

3. Use the utmost sanitation measures so as to prevent spread by mechanical means. Carefully disinfect all livestock instruments.

4. Blood transfusions are beneficial and may be used with valuable animals.

5. Two antibiotics, oxytetracycline and chlortetracycline, suppress the multiplication of the parasites and can rid carrier animals of infection.

11. Other Serious Diseases

There are many illness which could affect dairy cattle. Not all of these are as common as others nor is



Fig 7-4—Ringworm on the head of young heifer. This disease is contagious, so infected animals should be isolated and the scabs removed with soap and water before applying tincture of iodine.

the dairyman able to control every disease equally well. Fortunately some diseases which formerly were very great problems have been almost eliminated through cooperative government effort. For example, tuberculosis is no longer a problem with dairymen except that they should cooperate fully with authorities in keeping the disease stamped out. Another bright spot in the disease picture is that healthy, well-fed, properly housed animals have a tremendous amount of natural immunity and naturally tend to ward off diseases.

Following are several rather common diseases that dairymen may encounter and control.

Scours is an ever-present problem. A complete discussion is to be found in the chapter on Raising Dairy Calves.

Cowpox is an infectious disease which causes characteristic sores on the teats and udder. Delay milking, if possible, when sores are in the pustular stage. Treatment consists of healing the sores left by the blisters. Any oil or neutral ointment is an effective remedy. Milk the affected animals last.

Warts on the teats may sometimes attain size large enough to interfere with milking. When seen on the head or neck, they are unsightly. For warts on the teats, apply castor oil or pure olive oil after each milking for a week. If this treatment fails, touch them with a stick of caustic or tincture of iodine daily, and then oil. Long warts not too large can be removed by tying a silk thread tightly around the base. There is an internal remedy and a vaccine which are effective. Consult a veterinarian regarding this treatment.

Pinkeye is characterized by an inflamed, watery eye with a whitish or pinkish cast to the eye and eyelid. Affected animals should be separated immediately, as the disease spreads rapidly. Darkened quarters with feed and water in easy reach are desirable. The eye may be washed out with boric acid solution several times a day, but any measures other than that should be administered by a veterinarian. Other preparations such as a small amount of 2 per cent of yellow oxide of mercury ointment or several drops of 1-10,000 solution of pyoktanin blue placed between the eyeball and lid daily have also proved effective. Antibiotics have proved of value. The ones generally used are chlormycetin ointment (one per cent), terramycin pellets and penicillin solution or ointment.

Do not run or molest cattle with pinkeye.

CHAPTER VIII

PRODUCING HIGH QUALITY MILK

Twenty-five years ago consumers of milk weren't as particular as they are today. During the last few years scientists have found that milk is one of our best foods but it may also become a harmful food if it isn't produced and handled under sanitary conditions. City, state and federal health departments have set up regulations to assure that milk which enters into market channels will be clean and sanitary so that it will have good flavor and be free from harmful bacteria and other disease organisms. The dairy industry is co-operating in these programs. Steady progress is being made in improving the quality of milk.

If one is to make a real success in the dairy business he will need to keep up with the progress in producing milk of superior quality. Of course, it is more important to produce top quality milk for fluid use than when the milk is manufactured into cheese, butter or other dairy products. However, more and more stress is being placed on producing clean milk for all uses.

It isn't possible to make high quality cheese or butter out of low quality milk. There may soon come a day when the dairyman with milk of low quality simply won't have a market for it.

Suggested Activities Which Involve Approved Practices

1. Keeping the cows clean.
2. Maintaining a sanitary barn.
3. Reducing dirt produced when feeding.
4. Developing a sense of cleanliness with the milker.
5. Maintaining sterile milking equipment.
6. Keeping the milking machine clean.

7. Using the milking machine.
8. Maintaining a sanitary milkhouse.

We shall discuss each of these separately, following very closely the information in the University of Illinois circular, *The Production of High Quality Milk*.

1. The Cows—Keeping Them Clean

The dirt which comes from the cows is accountable for much of the visible dirt and bacteria in milk. Keeping the cows clean requires constant care. During the barn-feeding season, cows should be cleaned daily with



Fig. 8-1—A clean well clipped udder. Practices such as this are necessary in production of clean milk.

a brush and currycomb. Plenty of bedding should be used, and the bedding should be adjusted frequently so that the cows do not lie in manure or on bare floors. Muddy barn lots in which cows sometimes wade knee deep to reach the barn or the water tank probably contribute more than any other source to the dirt in milk.

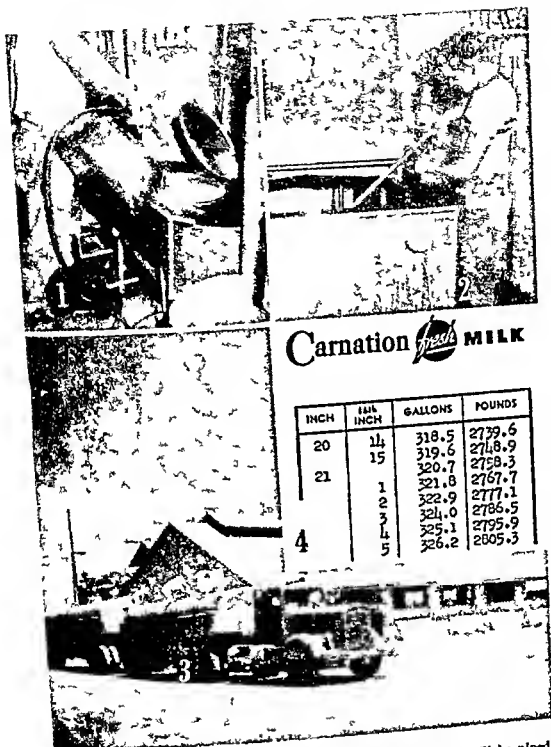
Grading and paving these lots with crushed stone, cinders or concrete greatly reduces the amount of labor necessary in the production of clean milk. Clipping the long hair from the udder and flanks makes these parts easier to keep clean.

The most effective single operation in keeping cows clean, as judged by its effect on the cleanliness of the milk, is the cleaning of the udders immediately before each milking. This operation should be faithfully performed. If the cows are very clean, as is usually the case when they are on clean, dry pastures, a thorough rubbing of udder and teats with a clean, well-moistened towel may suffice. If the udder is visibly dirty, a more complete washing with clean water will be needed. A small amount of chlorine disinfectant, commonly used in treating milk utensils, added to the wash water, is an aid in reducing the bacterial contamination of milk. In winter it is usually best to dry the udder and teats with a clean towel after washing in order to prevent chapping of the teats.

2. The Dairy Barn

It isn't necessary for a barn to be expensive in order to produce clean milk. Of course, the barn must be constructed so it can be kept clean. While concrete makes the best floor for a stanchion dairy barn, other materials will do. It is highly important that the material is not the type that will soak up moisture.

For the construction of gutters concrete is the best material. Walls should be tight, should be kept clean, and should be whitewashed or painted at least once a year. Ceilings which separate the milking barn from hay or feed storage space above should be tight enough to keep dust from sifting through and should be kept free of cobwebs and dust. Tight floor-to-ceiling partitions should separate the milking barn from quarters



Carnation *fresh* MILK

INCH	RAIN INCH	GALLONS	POUNDS
20	14	318.5	2739.6
	15	319.6	2748.9
21		320.7	2758.3
	1	321.8	2767.7
	2	322.9	2777.1
	3	324.0	2786.5
	4	325.1	2795.9
4	5	326.2	2805.3

- Fig. 8-2—
1. Here the milker is pouring milk directly into reservoir. Milk will be piped to strainer, cooler, and storage tank. Courtesy Pollard Dairy, Hillmar, California.
 2. Bulk storage tank for milk. Mechanical agitator in the tank assures correct butterfat sampling. Courtesy: Pollard Dairy Hillmar, California.
 3. Milk tank driver sealing truck after bulk pickup of milk. Labor in lifting cans is eliminated as well as the chances for dust and foreign matter to get into milk. Courtesy: Carnation Milk Company
 4. Sample section from page showing how dipstick readings are transposed to poundage of milk. Bulk handling is the modern, efficient way to transport and store milk. Initial cost is high, but more economical in the long run.



Fig. 8-3—

- 1 Milking parlors are tremendous time and labor savers. Having the cows elevated eliminates stooping and speeds up the milking operation. Notice that milk is piped directly to cooler thus eliminating lifting and pouring of milk pails plus the chance of contamination. Courtesy James Mfg. Co.
2. Mechanical manure loader and barn cleaner. A hard, dirty job can be eliminated by the use of mechanical manure-handling equipment. Courtesy James Mfg. Co.

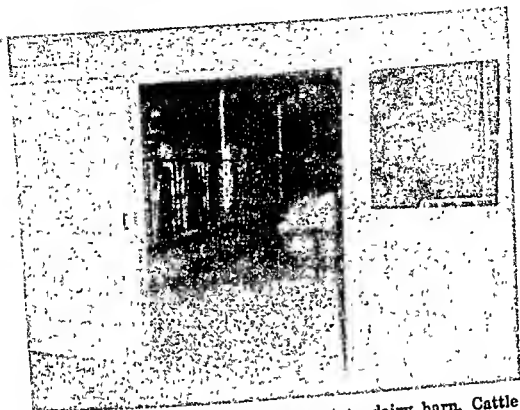


Fig. 8-4—Wide doorway leading into dairy barn. Cattle are less apt to crowd and injure themselves in such an entrance.



Fig. 8-5—Mechanical manure loader. Use of such labor-saving devices as barn cleaners and manure loaders are very desirable practices.

for other livestock and from feed storage space. A sufficient number of windows properly distributed to insure adequate lighting should be provided, and these windows should be kept clean.

Good dairymen remove the manure from the barn twice daily. It should be spread on the fields or stored at a sufficient distance from the barn, in a place to which the cattle do not have access. The walks, or litter alleys, should be cleaned daily and may be sprinkled with lime. In barns provided with water pressure systems, it is desirable to scrub the gutters, floors, litter alleys, and lower walls thoroughly at regular intervals, using water and stiff brushes.

3. Feeding the Cows

As a rule, dust particles are heavily laden with bacteria, and some of these particles are almost certain to get into the milk if the milking is done when the barn is dusty. Dusty feeds should be fed and dusty bedding should be handled only after milking so the dust will have time to settle before the next milking.

Some dairymen follow the practice of not feeding any kind of feed within an hour or two before milking or during milking. One of the necessary procedures in the treatment of udder troubles in high-producing cows is to immediately reduce the amount of grain mixture fed. Since abnormal conditions of the udder are likely to be detected first at milking time, reduction of the grain mixture can be begun earlier if feeding follows milking rather than precedes or accompanies it.

4. The Milker Himself

No dairy farm can produce clean, high-quality milk unless the milkers keep themselves clean.

It doesn't take much time, and it certainly isn't very expensive for the milker to keep his clothes reasonably

clean. Nor does it take much time for him to wash his hands before milking. A few dairymen simply don't care whether they are clean or dirty. Some don't stop to realize the importance of keeping clean hands and clothes during milking.

No matter how many rules and regulations are set up, they cannot cover all the situations that may arise. In fact they are of little value unless the workers have a keen sense of the responsibilities of their job and are constantly alert in the performance of this important task of producing human food.

The wearing of clean clothes at milking time not only helps to keep the milk clean but gives the milker a keener appreciation of the care needed in his work. It gives him a pride in his job. The practice of keeping a clean overall suit to be worn only for milking is a good one. As already pointed out, the hands should be carefully washed at the time milking is begun and after every interruption in the milking process. Milking should be done with dry hands; milking with wet hands, especially when milk is used for wetting the hands, is a filthy practice, for it adds not only dirt but great numbers of bacteria.

5. The Milk Pails and Strainers

The use of milk pails with tops partly enclosed or covered aids in keeping milk clean, because dirt which falls from the cow during milking is less likely to fall into a small opening than into a large one. Some experiments in which both open pails and partly covered pails were used showed that the number of bacteria in milk in the open pails was 80 times as great as that in the partly covered pails. The better dairymen everywhere are using small-top pails.

It's important to strain the milk but bacteria can't be strained out. They are so small that they go through

the strainer. They have to be kept out of the milk in the first place.

Wire gauze and cheesecloth strainers are very inefficient and, because of the difficulty of sterilizing them properly under most farm conditions, may add millions of bacteria to milk. A suitable strainer consists of a container of 3-gallon capacity or larger, with a bottom constructed of two perforated metal disks, at least one of which is removable and is held in place by a clamp. A sterile cotton pad is placed between the two metal disks and is discarded after each milking of the herd—or in large herds, after milking every 15 to 20 cows or as often as it appears dirty.

Shaking the strainer or jarring it on the can to hasten the passage of the milk should never be practiced. If the strainer pad becomes clogged, replace it with a new one. The sudden clogging of the strainer may be caused by thick or stringy milk.

Cows should not be permitted to drink from stagnant pools or foul-smelling water in barn lot seepage or drains. Cows may drink from these sources even though they have access to good water and the milk may acquire a bad odor or flavor as a result. Such conditions should be corrected by proper drainage or the use of fences to keep the cattle away. Sometimes water tanks are cleaned so infrequently that the water becomes foul and the milk of cows drinking the water is affected.

6. The Milking Machine

The milking machine is one of the greatest labor saving devices on the dairy farm.

Clean milk can be produced using a milking machine, but it must be kept clean to be safe. According to Cornell, N. Y. Bulletin No. 519, milking machines are not difficult to clean and to keep clean. Two wash tubs on a bench, or a two-compartment sink, make washing

easier than attempting to do the job in a 12-quart pail on the floor. Adequate brushes for the specific make of machine are indispensable, but they need not be elaborate or expensive. Brushes are not so harsh on rubber as are metal cleaning devices. The method of washing milking machines as here described requires a stall-cock in the milkhouse.

The construction of milking machines is such that persistent care must be exercised in cleaning them. The following parts require careful attention: teat cups and inflations; claws; rubber tubing; sight-glasses; pails; pail lids; valves; moisture traps or similar parts in pail lids; and vacuum lines.

Dairy experts from Ames, Iowa give eight important steps in cleaning the milking machine. They are easy to follow.

To keep the milking machine in top working condition and in a sanitary state you need to give regular attention to its repair and cleaning. How well the machine performs and how clean it is kept depends to a large extent on your skill as an operator and the effort you put forth.

One way to save time and effort in cleaning it is to use the *Flushing Method* of washing. At least once a day after flushing, the machine should be taken down and all parts brushed separately (see step 4).

The *Flushing Method* will be satisfactory only if (1) the machine is clean before changing to this method; (2) it is flushed immediately after each milking; and (3) proper wetting agents (synthetic detergents) are used as washing compounds. The time element in starting to wash the machine is important. No more time should elapse after the last cow is milked than would pass if another were to be milked.

Rinsing with cold water is not necessary if wetting agents are used as washing compounds.

This is the procedure to follow in washing the machine:

Immediately after or while the last cow is being milked, prepare a pailful of lively suds by dissolving a wetting agent (usually a tablespoonful) in hot water of 130 degrees to 150 degrees F. At that temperature the water is just too warm to immerse the hand. Then follow these steps:

- Step 1: Suck the *entire pailful* of suds into unit, dousing the cups in and out of water. Then shake the unit vigorously to wash the inside surface of the bucket.
- Step 2: Remove head, slip off sealing rubber and wash rubber and seat with a soft bottle brush. Then empty bucket back into pail and treat second unit with same suds.
- Step 3: Wash outside of unit with the soft bottle brush. Steel wool or a metal sponge will not be necessary even on rubber tubing.
- Step 4: For ideal sanitary conditions, at least once daily take the unit down completely and wash with the brush fitted for that part. Always make a thorough inspection of parts. If any milk solids can be scraped from inner surfaces of the inflation tubes or other parts, or if grit or other deposits can be seen or felt, you will need to break down the machine and rewash it with brushes and suds. Spongy rubber parts and inflation tubes that bulge should be discarded.

A slimy condition may occur if mastitis is prevalent in the herd. When tubes have fallen from teats or teats have not been washed before attaching the machine, all parts may need brushing after each milking. Some sterilizing and washing compounds may leave grit or deposits.

PRODUCING HIGH QUALITY MILK

- Step 5: When all parts are clean, reassemble the machine, draw a *pailful* of scalding water into unit and shake vigorously to rinse and heat surfaces. Dip head into hot water far enough so that rubber seal and seat will be scalded.
- Step 6: Dismantle machine and hang up tubes to drain and dry. A cabinet fitted with a small electric light bulb or chicken incubator thermostat will keep out dust and prevent freezing.
- Step 7: Just before milking draw a *pailful* of sterilizing solution into each unit and shake vigorously before emptying. The solution may be (a) boiling water, (b) water containing 200 parts per million quaternary ammonium, or (c) water containing 100 parts per million sodium hypochlorite.
- Step 8: To clean vacuum line and other parts, see the manufacturer's instruction book or consult your dealer.

The dull, grey deposit often found on dairy equipment is called milkstone. For sanitary reasons this material should be removed.

7. Using the Milking Machine

It is not only important to keep the milking machine clean. It is equally important to know how to use the machine on the cows. There are really only four steps to follow for success. Here's what the Wisconsin Special Circular, *Better Milking*, recommends:

1. Get the cow ready—*Wipe and massage udder and teats about half a minute. Use a cloth wrung out of very warm water (130 degrees F.)* This water should contain a suitable compound to kill bacteria. Chlorine compounds and solutions or the newer quaternary ammonium compounds give good results when

used according to directions on the containers. Those products are sold under various trade names.

Use a separate wash cloth for each cow and put the cloth into a pail containing a good dairy washing powder solution. Cloths about 18 inches square, made of flour sacks, are handy and carry enough heat.

Draw out foremilk—*Milk two or three streams into a strip cup from each quarter with a full hand squeeze.* The "let down" of milk—which has been started by wiping and massaging the udder and teats—is speeded up by foremilk.

Other good reasons for foremilk are (1) it draws out the milk with a high bacterial count, and (2) it helps the milker find any quarters giving abnormal milk. It's important to know right away when such milk appears, as it is a symptom of mastitis.

2 Put on cups promptly—The cow usually lets down milk within a minute after she has been prepared for milking. That's why teat cups should be attached promptly.

Don't stimulate too soon—If there is too long a time between preparation and milking, you may not get all the milk. So it isn't practical to prepare several cows ahead of the machine.

Many dairymen dip the teat cups into a pail of clear water and then into a pail containing a sterilizing solution (chlorine or quaternary ammonium compounds) after taking the machine off one cow and before attaching it to another. Such a procedure, if carefully followed, may aid in the control of mastitis and the production of high quality milk.

3 Use a timer—Most cows will milk out in three to four minutes, after a short training. While it may be possible to make a good guess as to how long the machine is on the cow, a timer makes it accurate. Then, too, if the time is not checked regularly, it's very easy for the milker to go back to the old routine. Egg

timers will do, but the running time of the sand must be checked. Inexpensive alarm clock timers are on the market.

Check your milking time—In one hour's time:
One single unit milker should milk 15 to 17 cows.
Two single units should milk 24 to 30 cows.
Three single units should milk 40 to 55 cows.

4. Strip by machine—At the end of the timed period, or as soon as the milk stops flowing, pull down on the teat cups with one hand and massage the udder with the other hand. Cows can be milked just as dry this way as by hand stripping. After a few milkings, the dairyman can tell by the feel of the udder when it is dry. Give special attention to those quarters that do not milk out as readily as the others.

Some dairymen prefer to hand strip. Hand stripping should follow immediately after removal of the machine. Use a full hand squeeze and do not strip too long. If a machine is left on after the milk stops flowing, it may cause injury to the udder that may lead to mastitis.

8. Other Suggestions on Producing Clean Milk

Some excellent general suggestions on producing clean milk and on keeping the dairy barn clean are given in Wisconsin Extension Circular 356.

Screen windows and doors during the fly season. Have ceilings tight so dirt and chaff won't fall into the milk. Nail boards over any open cracks to prevent dirt from sifting through the ceiling. Clean out smelly feeds like silage so they will not be left lying around the cow barn between feeding times. Haul manure daily to the field whenever possible or at least far enough away to a place where the cows won't get to it. If horses are kept in the barn, provide a partition to separate them from the cows.

Horse barns have a strong, typical odor which is



Fig. 8-6—Four essentials for clean milk: a. Wash hands, b. Clean cow's udder, c. Use strip cup, d. Put on teat cups properly.

easily taken up by milk. When chickens or other animals are kept in the barn it is next to impossible to keep it clean and sanitary.

Insects are among the worst pests of the dairy industry as they spread disease and filth and ruin the quality of milk. Flies are the worst offenders because they leave germs and filth on everything they touch. Millions of harmful bacteria may be carried by one fly.

To control insects: (1) Get rid of every possible place where they can breed and feed. This means keeping milkhouses, barns, cowyards and surroundings clean and free from rubbish and hauling manure away daily whenever possible and treating with an insecticide approved for that purpose. (2) Lime the barn floor daily to aid in keeping it clean smelling. (3) Keep milkhouse windows screened. (4) Kill any flies that get into the milkhouse by spraying with a suitable spray. (5) Kill flies on the cows by spraying them before milking during fly season. (6) Strain all the milk in the milkhouse where flies can be kept out.

The harm from insects has been done if they get into the milk in the first place; it cannot be undone by straining them out. Not only do insects add bacteria,

some of which may be disease producing, but they also leave telltale microscopic insect parts which make the milk and any products made from it illegal for sale as human food in interstate commerce.

The presence of such insect parts has resulted in the confiscation of dairy products by the federal government and the loss of good markets.

References for Chapter

(High Quality Milk)

1. *Washing the Milking Machine*—Iowa State College Pamphlet No. 148
2. *Milking Machines*—Cornell, Bulletin 519, Ithaca, New York
3. *Production of High-Quality Milk*—Univ. of Illinois Mimeographed Circular by W. B. Nevens
4. *Better Milking Cuts Costs*—Extension Service, College of Agriculture, Madison, Wisconsin
5. *Milking Machine Maintenance*—Mimeographed Bulletin No. 315, Dept. of Agricultural Engineering, New York State College of Agriculture, Ithaca, New York
6. *Fourteen Steps to Good Milk*—Wisconsin Circular 356, University of Wisconsin, Madison, Wis.

CHAPTER IX

THE FARM MILKHOUSE

You can't operate a modern dairy without a milkhouse. The questions you will naturally ask are, "What kind of milkhouse do I need? Will it be too expensive?"

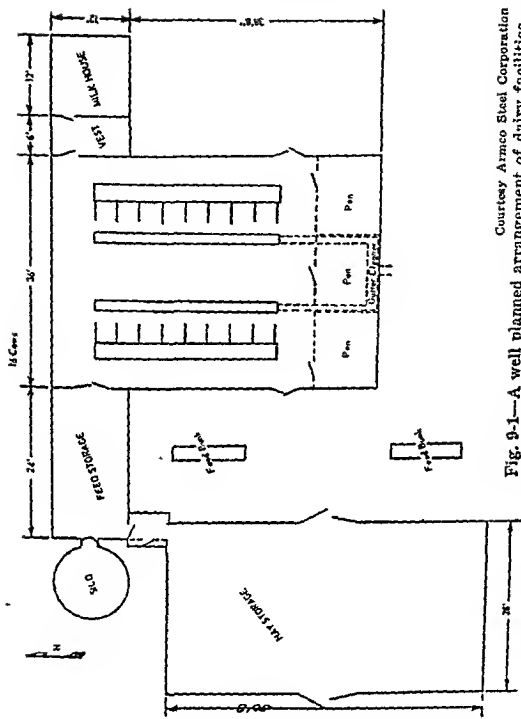
Suggested Activities Which Involve Approved Practices

1. Determining the kind of milkhouse.
2. Locating the buildings properly.
3. Deciding on type of construction.
4. Obtaining proper lighting and electric service.
5. Obtaining proper ventilation and insulation.

1. Kind of Milkhouse Needed

The kind of milkhouse that will fit your needs will depend on your market outlet and upon the size of your dairy herd. Milkhouses vary from small rooms outside the milking barn to rather large elaborate and expensive houses equipped with modern and highly sanitary equipment. In this chapter we shall discuss the less elaborate milkhouse, the kind that would serve the average dairy farm. If you have a large dairy herd and supply a fluid milk market with rigid sanitary requirements then it may be necessary to get special help to design and help build a milkhouse that is satisfactory.

The modern dairy farm, even though it sells milk for manufacturing purposes, will use the milkhouse for separating the milk, cooling the milk and cream and for keeping the dairy utensils. A modest milkhouse that will serve this purpose is not expensive and will pay for itself by the convenience in handling the milk and for washing and storing the milking utensils. This



Courtesy Armco Steel Corporation
Fig. 9-1—A well planned arrangement of dairy facilities.

milking room, or milkhouse, is attached to or placed near the milking barn.

We want to emphasize at the outset that the arrangement of the milkhouse and the location in relation to the barn depends so much upon the requirements of the market that no one kind of milkhouse can be built

at a reasonable cost which will meet the requirements of all farms and of all milk markets. You have to plan your milkhouse to fit your present market and the market you expect to supply in the near future. If your market is for a fluid milk in a city with rigid requirements you will need to get information from those well informed on the requirements.

2. Locating the Milkhouse

Selecting a suitable location for the milkhouse is not only a special but an individual problem on each dairy farm. In some instances, working out a convenient arrangement is the most difficult part of the planning. However, by following a few simple rules, usually a satisfactory location can be selected or developed.

Before deciding upon any milkhouse plan or location, consider carefully any future building changes as they may influence the entire dairy unit. Some of the most common might include: Barn remodeling, addition to the barn to take care of herd increase, or chang-



Fig. 9-2—A good type milkhouse conveniently located.

ing the method of housing, new silo or feed rooms, and relocating the cowyard and service yards. This in turn, may affect entrance and service driveways, gates and lanes leading to fields. On some farms, the site may influence the location because some farmsteads are on a level site while others may be on a hillside. In such cases, excavating or grading yards to improve drainage or relocating some other buildings may enter the picture. Of course, all these conditions will not be found on any one farm; and many changes would be spread over a longtime improvement program.

Locate milkhouse on clean side of barn, away from the cowyard and silo. Provide good drainage; develop gravel turnaround with as much grass area as possible to avoid dust and mud.

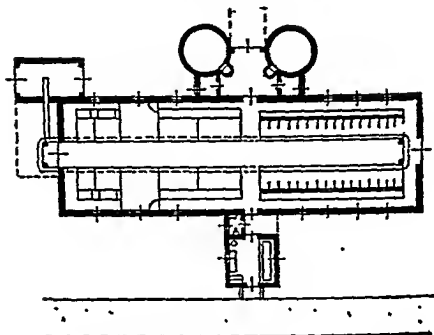
Locate for the least amount of travel between the dairy unit and milkhouse to save time and energy. In the center alley type barn, accommodating up to 20 cows, an end location will usually be satisfactory. However, for larger herds, the milkhouse should be as near the center of the dairy unit as possible.

Avoid a location that will make it necessary to carry the milk through the pen or horse section of the barn, silo or feed storage room.

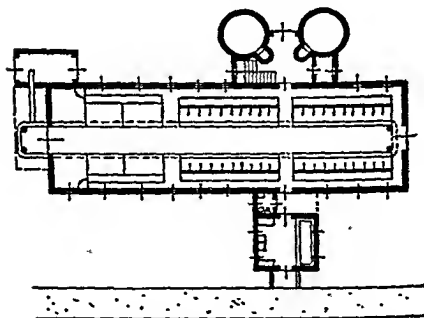
Locate so that pickup will be convenient for milk truck and take advantage of sloping sites to develop a more convenient loading platform.

Consider water supply and waste disposal. Sometimes when running water is not available at the barn, the milkhouse is wisely located near the well. This will not permit the use of the milkhouse in accordance with most market requirements. It is more practical to pipe water to the milkhouse located at the barn.

According to Pamphlet No. 126 of Ames, Iowa—the milking room (or room where milk is kept) should be in a separate house attached to or placed near the milk-



20 TO 32 COWS



32 TO 46 COWS

Fig. 9-3—Typical floor plans for stanchion barns complete with milkhouse, silos and manure cleaner provisions that are adaptable to either one or two-story barns. They are arranged so as to permit future expansion.

ing barn. Or it may be a room within the barn, provided it is properly isolated from the stable. Health regulations vary on this point. Check with your market outlet. Doors should open outward and not lead directly into the barn or any room used for domestic purposes. Milk loading or the removal of skim milk can be made convenient by a well located loading door.

A common regret of people who have built milk houses is that they have made them too small; 12' x 16' is the recommended size. Your College of Agriculture will likely have plans for milkhouses. Write them before you start to build or remodel your milkhouse. Checking first is an important practice as there may be state laws or a code that must be followed.

3. Foundation and Floors

In general, foundation walls eight inches thick of concrete, block, brick or tile are adequate for a continuous wall. Rubble stone laid in concrete makes a strong foundation. If foundation walls are of rubble stone, the thickness should be at least 16 inches. Footings should rest upon firm soil below the frost line.

It is usually advisable to carry the eight-inch foundation walls up one foot above ground level.

Make the concrete floor five inches thick and place it in one course using the same quality of concrete throughout.

Slope the floor one-fourth inch per foot toward the drain. All corners and angles at junction of wall and floor may be rounded with a bottle to make sanitary joints. First level the floor with a wood float to a uniform surface. After the concrete has become quite stiff, finish it with a steel trowel. This produces a dense, smooth surface which cleans and wears well. Cure the floor by keeping it moist for several days.

Frame walls must be anchored to the foundation by five-eighths- or three-fourths-inch bolts spaced six to



Fig. 9-4—Excellent type single-story steel dairy barn, Nuding Bros., Celina, Ohio.

eight feet apart to resist wind and flood. Bolts extending less than 12 to 18 inches into concrete walls, and two to three feet into walls of block, tile, brick or stone, are likely to be pulled out of the foundation.

Reinforcement at the corners prevents cracks in the foundation. Half-inch rods six feet long are usually bent into L's and laid in the center of the wall at each eight inches of height so that one leg of each projects into the end wall and the other into the side wall.

4. Lighting and Electric Service

Besides generous window area, equivalent to 15 per cent of the floor area, artificial lighting is desirable. Where electric service is available, a 75- to 100-watt lamp in a porcelain-enameled reflector should be located in the center of the ceiling. Have a generous number of carefully located wall outlets. Because of the high moisture condition in a milk house, non-metallic, sheath-covered cable should be used for wiring.

5. Ventilation and Insulation

Proper ventilation is required to keep the air dry and fresh. You cannot have a dry house with cold walls and ceiling on which moisture will condense. Since moisture does not collect on warm surfaces, insulated walls and ceiling help tremendously in keeping a milkhouse dry. A 12-inch electric exhaust fan located above the sink and high up on the wall near the ceiling will help in removing excess moisture.

The following are important considerations in selecting and installing insulation materials:

1. Use of vapor barriers is recommended on the warm side of insulation in the side walls and roof to prevent condensation of water vapor in the insulation or on timbers next to it.
2. Insulation should not be placed in contact with roof boards. When insulation is installed in a roof, an air space should be provided between the insulation and the roof boards. A vapor barrier should be used on the warm side of the insulation.
3. Louvers in the gable ends provide needed attic ventilation.
4. Insulation helps in keeping a house cool in the summer because it reduces the flow of heat into the house during the warmer part of the day. Cooling by night ventilation is made more effective where insulation has been applied.

The cooling tank, tables and wash sink, as well as the can rack, could be permanently placed. However, this does not allow for easy cleaning or for rearrangement when desired.

The milk can be brought in on a cart and conveniently left in front of either the cooling tank or the cream separator. When separating is being done, the cart can be used for moving the skim milk either into



Fig 9 5 The bulk milk tank is becoming common on dairy farms in order to properly cool and store milk. It is also a great labor saver Initial cost is high.

the barn or to the loading door for feeding on some other part of the farm.

The cooling tank must be located convenient to the water inlet and outlet. If a mechanical cooler is used, the spot near the loading door should be the most convenient. If desired, the cooling tank can be lowered into a pit, just so the floor of the pit is higher than the draining tile. An outlet through the tile provides drainage and allows cleaning. With this arrangement, cans need not be lifted as high to get them in and out of the tank, which makes handling a lot easier.

Utilize mechanical refrigeration—One of the most important factors in producing Grade A milk is to keep the bacterial count down low enough so as to conform with ~~state~~ laws. For example the state agriculture

code for California regarding minimum requirements for guaranteed raw milk in addition to other factors is as follows:

"Milk should be cooled immediately after being drawn from a cow or goat to fifty degrees Fahrenheit or less and so maintained until delivered to the customer at which time it shall contain not more than 10,000 bacteria per milliliter."

From a practical standpoint, this is impossible without mechanical refrigeration except in some of the cooler climates. In fact, in all mild climates, new dairy milking barns will not be approved by the inspector unless mechanical refrigeration is included. The best source of information on what equipment to get is to contact local suppliers and get their various ideas and estimates. As a general rule it will pay to get an outfit slightly larger than the size needed for the immediate job in case of herd expansion although dairymen must guard against over capitalizing. Oversize equipment seldom has as many breakdowns because it is seldom under strain.

There are many different styles of mechanical coolers. For example, a walk-in box may have some advantages over a side-door style or lift-out type. A dairyman should carefully weigh one against the other in determining what type best suits his farm and labor conditions. Bulk or single tank delivery is also becoming more and more common. Producers contemplating a new milking parlor should investigate this method. Remember, the primary aim is to deliver clean milk with a minimum of bacteria count.

The divided wash sink is a great convenience. It speeds up the washing of equipment by allowing the washing to be done in one half and rinsing in the other.

The drain rack is made of inch pipe. Size should be large enough to provide sufficient space for all cans



Fig. 9-6—A divided sink is a must in the milkhouse. Heat lamps above the sink improve the comfort of the room.

and tables. For a large herd it is better to have several racks of this smaller size rather than one large one. Smaller racks are more easily removed and spaced. A coupling or cap screwed onto the bottom of the leg allows for leg adjustment. This fits the rack firmly on the sloping floor.

A 12-inch exhaust fan, in the wall just above the wash sink, will help remove much moisture from the room, ~~and~~ ^{also} help while washing equipment.

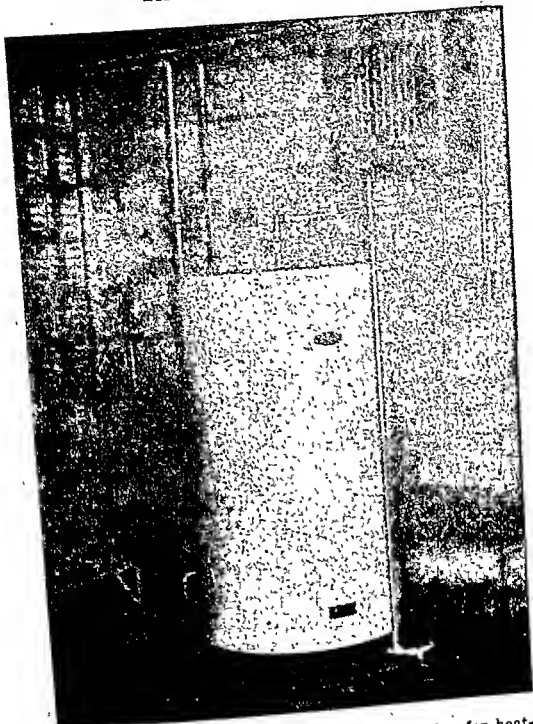


Fig. 9-7—Large water heater coupled with fan for heating the room are modern conveniences in many milkhouses.

Experts from the Pennsylvania State University say: In putting the building together consult a reliable builder or some one with experience to help avoid constructional difficulties. May we also suggest that you contact the field man of the company to whom you ship

milk and consult him prior to starting work. Your County Agricultural Agent also has plans and the information to help you.

Remember—properly planning and building your milkhouse will eliminate steps, save labor, and, if it is properly equipped and used, help to produce a better quality in milk.

Heating the Milkhouse

In the colder areas of the country it is necessary to provide some heat in the milkhouse. Most dairymen prefer to keep it at the barn temperature, around 50 degrees. If the house is well insulated only a limited amount of heat is required. In the larger milkhouses oil heaters are commonly used but, when they are installed, proper vent pipes have to be provided so no fumes will get into the milkhouse. Usually they are set in a corner and partitioned from the rest of the milkhouse with heat conducting material.

Electric heaters are becoming more and more popular in the smaller milkhouses. Heat lamps, placed over the area where utensils are washed, are used by many dairymen as the only means of heating.

Milkhouse heating arrangements and the general sanitary requirements are changing so rapidly and vary so much from area to area that it is highly desirable to check carefully with your county agent, with the organization that buys your milk or with state inspectors before you finally decide on the type of house to build or on the arrangements for heating.

CHAPTER X

THE DAIRY BARN

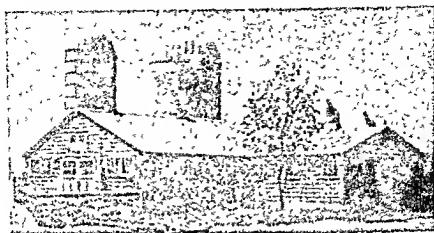
Things to Consider in Planning Your Barn

Your grandfather could build any kind of a dairy barn that suited him. No one told him what kind of a barn he needed to meet health and sanitation requirements. Today it's different. You have to build a dairy barn to suit yourself. But you also need one that meets the health requirements of the market that you are selling to. In fact, you have to look even farther ahead than that. When you are building a new barn or remodeling your old one, you will want to have in mind not only the market you are selling to now but also the market that you may want to sell to later—next year or five years from now.

Here are some questions you will want to ask yourself when you are making your plans:

1. What markets are likely to be available in this area?
2. What are the health and milk sanitation requirements of these markets?
3. How can I build the barn to meet these requirements and yet keep the cost down?

Housing for dairy cattle is one of the major costs of operating a dairy herd. The successful dairy farmer wants to keep that cost as low as possible. However, it is also important that the dairy barn be planned so that (1) he can meet health requirements and (2) he can produce milk efficiently, and (3) so that it will be a pleasure, not a constant annoyance to work at the job of doing chores. Half of the satisfaction of running a dairy farm is to have a pleasant place to take care of the dairy herd.



Courtesy Martin Steel Products Corporation, Mansfield, Ohio

Fig. 10-1—A modern dairy barn. On today's farms, mechanized equipment and modern engineering go hand in hand to bring increased efficiency and increased profits, with greater than ever convenience.

You will get more enjoyment and a greater income from your dairy herd if your barn is neat, well kept, and planned for service. Yes, planned to save you steps. Perhaps it can be put this way: You balance low cost of a dairy barn against convenience and comfort of the cows together with an arrangement so you can do the work of milking, feeding and cleaning the barn as easily as possible.

Suggested Activities Which Involve Approved Practices

1. Saving labor by good planning.
2. Choosing the kind of house to best provide for the dairy herd.
3. Determining size of cow stalls.
4. Determining interior barn arrangement.
5. Determining most desirable stabling areas.

1. Save Labor by Good Planning of Barn

About 150 man hours of labor per year is required to take care of a dairy cow. Feed is the only other cost that

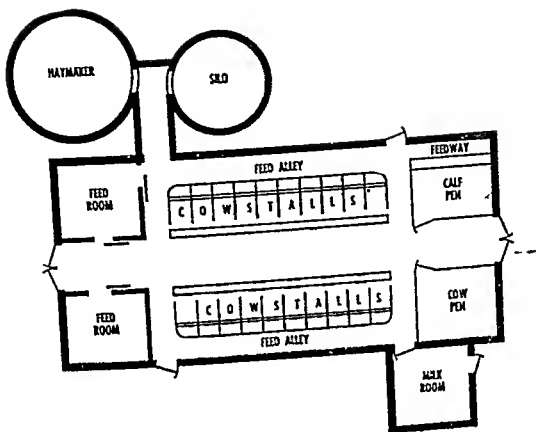


Fig. 10-2—A typical and widely used arrangement for dairying convenience. A stanchion barn, complete with milkhouse, haymaker and silo. Easy to keep sanitary.

is higher. Naturally you will want to save as much labor as possible so as to increase the income from your herd. There is a wide range in the time requirement per cow on dairy farms. Of course some dairy farmers work faster than others so they do more work in the same length of time. But it is also true that some dairy-men have their barns planned and their work arranged so they can do more in the same length of time than others. For example, according to Regional Bulletin 470, *Dairy Cattle Housing*, one farmer spent more than twice as much time as another. One man with 21 cows averaged 90 man-hours per cow for the year. Another dairyman with the same number of cows worked 193 man-hours per cow.

Many farmers remodel their barns to reduce the time and energy of doing chores or to meet up-to-date sanitary regulations.

It is possible too for a farmer to reduce the amount of walking as much as two miles a day by changing the barn arrangements or plan of work.

Steps to Save Labor

The first step to reduce chore time is careful and complete planning of the dairy cattle housing unit. The plans should be carefully drawn up to scale before even the foundation is started. Build it on paper first! The type of equipment selected must be reasonable in cost and easy to operate. It must also be a kind that shows promise of long service without giving too much trouble. The saving in time and energy due to a good

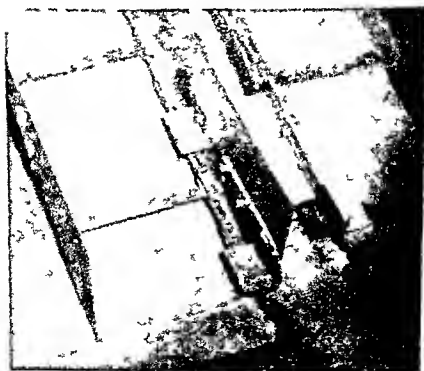


Fig 10-3—Mechanical barn cleaner. Another sample of labor saving devices that can be put into practice on many dairies.



Fig. 10-4—Vacuum from the milking machine operates this piston which opens and closes the gate to the milking parlor by remote control.

plan and carefully selected equipment may make the difference between being a very successful dairyman or just an average one. Whenever you can replace hand work with mechanical power you naturally save energy.

When automatic controls replace hand operated controls you can free yourself from work and use your energy for something else. Of course, it is a mistake to put in automatic equipment, or other equipment if it is too expensive. Suppose you build an expensive barn or put in some expensive equipment and later the price of milk goes down. Then you may be in a financial difficulty.

2. What Kind of Housing Shall I Provide for the Dairy Herd?

There are two general ways of housing dairy cows, the staunchion type and the "loose" or pen type barn.

The Stanchion Barn

For years the stanchion barn has been almost the only type of dairy barn and is still in common use. However, the pen type or loose barn is being used by more and more dairy farmers. Stanchion barns may be either one story or two stories. Here is what Bulletin 470 says:

Perhaps the most common type, especially in the northern zones, is the two story barn with feed and



Courtesy Martin Steel Products Corporation, Mansfield, Ohio

Fig. 10-5—A spacious stanchion barn. Modern dairymen prefer well planned spacious interiors. In this barn hay and bedding are stored overhead.

bedding storage on the floor over the livestock. The one-story barn, more frequently found in the southern zones, is being looked upon with increasing favor throughout the entire region because of a number of advantages. A description of both types of barns is presented on the following pages.

The two-story barn—This must have a frame strong enough to carry the weight of a winter supply of hay,

grain and bedding for the herd, as well as loads imposed by wind and snow. Many variations are possible in detailed arrangements but basic design and dimensions have become almost standard.

Storing hay, grain and bedding above the dairy herd has many advantages. Here hay and bedding are placed where they can be used by simply throwing them down conveniently located chutes into the feed and litter alleys below. By building the two-story structure, only one foundation and one roof are required. Economies in building costs and labor of operation are thus secured which are hard to obtain in one-story construction.

The fire hazards of two-story barns are a serious problem. Fire in the hay loft of a barn can seldom be brought under control or put out. While insurance can be carried on the barn, feed and livestock, the work of years of breeding and the loss of income from the dairy enterprise until a new barn can be built, can be a serious loss.

To overcome this hazard, at least in part, the reinforced concrete mow floor has been successfully used. Recently mow floor construction of masonry units of various types has been developed. Where there is a fireproof mow floor, self-closing doors in the hay chutes and stairway to the haymow are essential to protect the contents of the first floor in case of fire.

Advantages of the two-story barn:

1. Economical to build because of one roof and one foundation and standard construction. Comparable cost figures will answer the question of which can be built for the lowest price.
2. Convenient to work in because all is under one roof with feed moving by gravity from second to first floor.
3. Dairy workers are used to the method of herd

management in a two-story barn. Likewise, tenants may prefer two-story barns if that is what they are used to.

4. More compact with reference to space required and therefore easier to arrange with cattle yard on one side and service yard on the opposite side.

The one-story barn—There seems to be a growing interest in one-story barns, due in part to the growing use of baled or chopped hay or grass silage. Those who have this type of dairy unit find that it works out to their satisfaction when it has been well planned, and when the layout is complete.

Owners of one-story barns claim the following advantages:

1. Reduce fire risk to herd and milk income.
2. Reduce windstorm hazard.
3. Easier to move chopped or baled hay and even loose hay along a concrete walk on rubber tired, roller bearing carts than feed it down hay chutes.
4. Dairy unit can be built a part at a time, thus the initial construction cost of a complete unit is spread over a number of years.
5. Easier to build than barns of two-story construction.
6. Easier to repair, paint, reroof and maintain.

3. Size of Cow Stalls

The size of the stall or stanchion you need depends upon the size of your cows. You can't fit the cow to the stanchion so you fit the stanchion to the cow. A big Holstein needs a larger stall than a small Jersey.

The table below shows the dimensions of stalls for cows of different weights and sizes. (From Regional Bulletin 470).

Weight of Cow	Girth in inches (1)	Width of Stall	Stall Length (2)	
			Standard Stall	Cow Trainer Stall
800 lbs. -----	65"	3'-4"	4'-6"	4'-8"
1000 lbs. -----	70½"	3'-8"	4'-8"	5'-0"
1200 lbs. -----	75"	4'-0"	5'-0"	5'-4"
1400 lbs. -----	79½"	4'-4"	5'-4"	5'-8"
1600 lbs. -----	84"	4'-8"	5'-8"	6'-0"

It's a good idea to have stalls of different sizes in your cow barn. Then you can put the cows in the stalls that fit. The length of the stalls can be varied with little trouble by having one end of the stanchion section short and gradually increasing the length of stall to the other end. All you do is build the gutter at a slight angle with the manger. This will mean that the litter alley will be narrower at one end of the stanchion than at the other.

For example the stall might be four and a half feet at one end of the stanchion section and five feet four inches at the other. This will mean that your litter alley will be narrower at one end than the other, but the feed alley will be the same width all along the stanchion section.

The width of the stalls can also be adjusted to fit the size of cows. For average size cows the short stalls should be about three feet six inches wide and the longest about four feet four inches wide. A good average stall is about four feet wide. Stalls of that size would be along the middle of the stanchion section.

Size of pens—In addition to the stalls the dairy barn has to have pens for the calves, for the cows during calving time and for a herd sire if you have one. The recommended size pen is shown in the following table:

	Jersey and Guernsey	Holstein, Brown Swiss, Shorthorn and Ayrshire	Partition heights
Bull pens.....	10' x 12' to 12' x 12'	12' x 12' to 12' x 14'	5'-3"
Cow pens (Test or maternity).....	10' x 10' to 10' x 12'	10' x 10' to 12' x 12'	4'-6"
Individual calf pens.....	4' x 6'	6' x 6'	3'-9"
Calf pens for four.....	10' x 10'	10' x 12'	4'-6"

For a number of calves in one pen allow 20 square feet per calf, and 20 to 25 per calf for a stanchion and manger space.

4. Interior Barn Arrangement

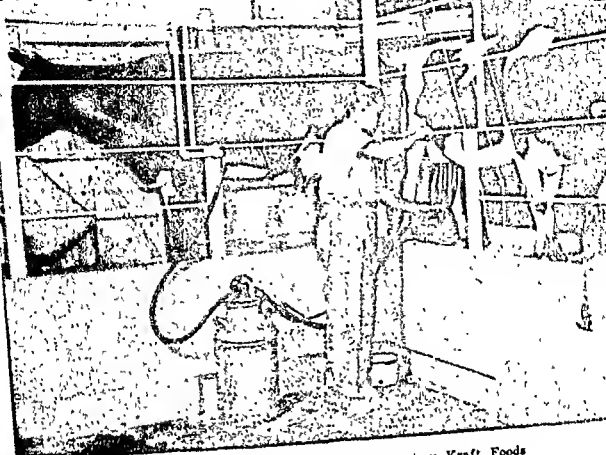
There are many different arrangements in dairy barns because they were likely built for other purposes. However the most common type of dairy barn is one where the stanchions run the long way of the barn. The cows, when "tied" in the stanchions, either face in toward the middle of the barn or out toward the sides of it. There are advantages of each type but, everything considered, the advantages of the *face out* type probably outweigh those of the *face in* type.

Here are the main advantages of having the cows face out:

1. It is easier and more economical to clean stables where one can drive through with a manure spreader. When a driveway can be used, there is no rehandling of manure and the expense of a costly overhead litter-carrier system is avoided.

2. Cows can get in and out of a wide door with more safety. It is generally less difficult for cows to find their stanchions when entering the barn at the driveway.

3. Hay chutes can be placed along the side walls of the barn. The opening of the hay chute into the basement, or lower floor, is directly in front of the cows. It is easier to put hay into chutes at the side of the barn



Courtesy Kraft Foods

Fig. 10-6—The milking parlor with the raised platform saves stooping to put on and remove teat cups.

than in the middle of the mow, as the settled hay is always higher at the middle.

4. There never was a barn built, in which the cows face the center, that was wide enough to prevent the side walls from being spattered with manure. It is desirable if not necessary to keep the side walls clean, but it is very difficult if the cows face the center.

There are also some advantages of having the cows face in.

1. The animals are fed more easily and quickly. The grain, silage, and hay can be fed much more quickly when the cows face a central feed alley.

2. The posts in the barn, if any, are not in the way. When the cows face in, posts supporting the cross timbers can be placed at the stanchion ridge. This arrangement of posts makes their spacing about equal. If the posts are arranged with equal spacing, when the cows face out they will stand near the gutter.

Some other advantages suggested by dairymen but of minor importance are:

3. The milkers are nearer the light.

4. There may be an advantage in showing cows to prospective buyers.

5. Slightly narrower barns can be used. (From Regional Bulletin No. 470.)

A *face out* barn needs to be about 36 feet wide especially if the manure is to be loaded into a manure spreader in the driveway. If a barn cleaner is used the litter alley may be only six feet wide compared with eight feet when it is used for a driveway. This would

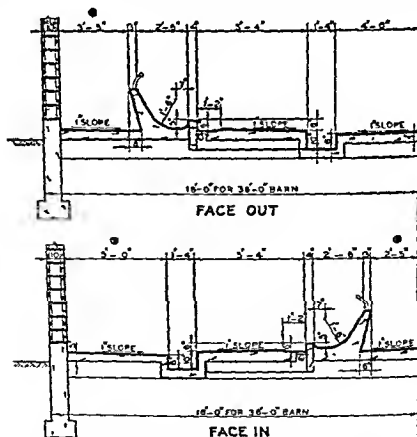


Fig. 10-7—Proper measurement and correct slope are necessary for comfort and sanitation.

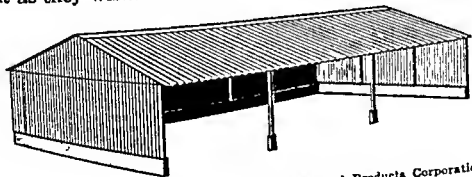
mean that 34 feet would be wide enough. Local milk inspection regulations vary on this point so one would want to check that before designing a new barn or remodeling an old one.

The exact width of the barn depends also on the width of the manger and the feed alley. For herds of a dozen cows or more you will save labor by having a feed alley wide enough for a feed cart. Generally speaking a barn has to be more than 30 feet wide to be convenient except for a small herd where dairying is not an important part of the farm business.

The Pen Stable or "Loose Housing" Arrangement

During the past few years the so-called pen type barn has come into use on many farms.

The pen type barn, or loose housing, is an arrangement where the dairy cows run loose in a barn. It is usually partly open on one side so they can go in and out as they wish. The manure is allowed to stay in the



Courtesy Martin Steel Products Corporation
Fig. 10-8—Open shed plan. This is the simplest, least expensive permanent shelter possible for your cattle.

barn, usually all winter, and a good supply of straw is added from day to day so the barn is always dry and fairly clean.

The cows are driven into a milking parlor for milking where each cow eats her grain while she is being milked.

The dairy cows are fed hay or silage in simple

bunks or racks. They are usually watered in a central water tank.

Here are the main advantages and disadvantages of loose housing.

Advantages

1 Milking is done in a clean, compact, efficient milking room. The cows come to the milker, saving many steps for the worker. Stooping is eliminated—the cows can be milked while standing on elevated stalls so the milker doesn't have to stoop to clean the cow's udder or to put on the teat cups. It is easier to keep milk clean because the cows' udders can be washed thoroughly with little effort, there is no bedding and little manure in the milking stalls, the stalls can be easily swept and washed.

2 There is flexibility of herd size. Room for more cows can be readily made by lengthening the hay and silage bunks and by enlarging the pens. More cows can be added temporarily by crowding the cows in the feeding and loafing areas.

3 There is flexibility of use of buildings. The barn can be used for beef cattle, sheep, and hogs with minor changes in arrangement and equipment.

4. The manure is well preserved. By providing ample headroom in the loafing area, manure can be accumulated until the farmer can use it in the field. All droppings and urine, with generous amounts of bedding, are kept under a roof and are well compacted, thus reducing losses.

5. Injuries to cows are kept at a minimum. There are no gutters to injure udders and legs and no stanch-

Disadvantages

1 It may be cold for the workers. If the barn is not insulated and if the doors are left open the temperature inside the barn may be only 10 or 20 degrees above the outside temperature. Artificial heat may be needed in the milking room, at least on the coldest days.

2. The herd cannot be displayed easily. Many sellers of dairy breeding stock prefer to tie their cattle in rows for display to customers.

3. More bedding is needed. Two or three times as much bedding as in a stanchion barn may be needed. Loose housing barns must be bedded liberally to maintain sanitary conditions. This is a serious drawback in areas where bedding is scarce and expensive. It also increases the amount of time needed for spreading the bedding. For ample bedding, about 3,500 pounds of straw per cow will be needed for one season, compared with 1,500 pounds in a stanchion barn.

4. Cows in heat disturb the herd. This can be minimized by providing a pen into which the cow in heat can be placed.

5. A larger building is needed. The total floor area for a loose housing barn will be 10 to 25 per cent more than for a stanchion barn.

6. It may reduce the sale or rental value of the farm. Most buyers and renters are familiar with the stanchion barn, they may be reluctant

Advantages

ion curbs to injure knees. Cows lie on a deeply bedded surface, keeping udders warm; the temperature at the bedded surface may be as high as 100 degrees even on the coldest days.

6. It is easy to detect cows in heat, because the cows are free to mingle most of the time.

7. The building construction can be of an inexpensive type. The feeding and loafing shed need not be insulated; it must merely protect the cows from wind and rain. The floors in the feeding and loafing shed are simple and no elaborate forming is needed. The milking room is small and the construction is simple.

8. Less expensive buildings may be used than those required for stanchion barns. Buildings not suitable for a stanchion barn may be used for a "pen barn."

9. Cows will consume more roughage.

10. Labor requirements will be less than for a stanchion barn—if the pen barn is well arranged.

(From Minn. Extension Circular No. 146 and Cornell Bulletin No. 395.)

5. General Arrangement of Pen Type Barn

The pen stable must have three separate areas.

1. A Bedded Loafing Area where the cows sleep or rest. Feeding or watering the animals in this area should not be permitted. Cows should enter and leave this area through one way gates.

2. Paved Feeding Area where the cows are fed hay and silage and are watered. This area should be cleaned daily.

Disadvantages

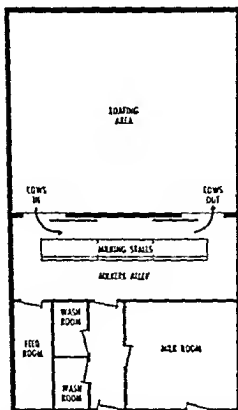
to accept a new type of barn. Others may not plan to keep dairy cows and may value highly the flexibility in the use of the loose housing barn.

7. Milk inspectors in some areas may not approve the loose housing barn. With too little bedding or careless management the cows become dirty and the quality of the milk can be seriously reduced. It is advisable to consult the milk inspector (if there is one) before constructing a loose housing barn.

8. Timid cows or bossy cows are often a problem. All cattle in barn must be dehorned.

9. Ceiling height must be 10 to 12 feet in loafing area.

10. If the farm is tenant-operated it may be difficult to get a competent operator.



Courtesy Martin Steel Products Corporation

Fig. 10-9—Here's a popular method for housing dairy cattle . . . with loose housing and milking facilities that provide greatest possible ease in herd care. Cows leave the loading area, file into the milking stalls through swinging gates; entry and exit are easy, fast.

3. Milking Area where the milking parlor and milkhouse are located. The cows should enter the milking parlor from the paved feeding area or from the paved barnyard. Exit from the milking parlor should always be back to one of these areas.

Experience has shown that two other areas are highly desirable.

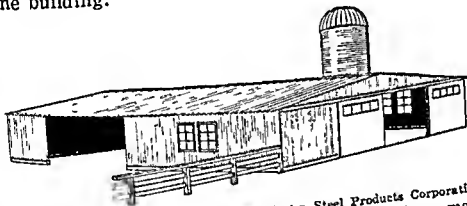
1. Paved Barnyard—This is a paved area outside the regular feeding area. One hundred square feet per cow should be provided. Watering facilities and supplemental feed facilities may be located in this area.

2. Maternity and Calf Pen Area—When additional floor area is provided in the bedded area, maternity pens and calf pens may be built out of movable partitions. Dry cows, calving cows, sick cows, or calves may thus be kept within the walls of the loafing area.

Bedded Loafing Area

Holsteins and other large cows require a total floor area of 90-100 square feet per mature animal. Ayrshires, Guernseys and other medium sized cows 80-90 square feet and Jerseys and other small cows 70-80 square feet. Of the total floor area 25-30 square feet per cow which is to be used for feeding must be paved.

The remaining space per cow will be the bedded area. The paved area and the bedded area need not be in the same building.



Courtesy Martin Steel Products Corporation
Fig. 10-10—Semi-open shed plan. This type of barn may be used for cattle and later converted to other uses such as equipment housing.

At least 3,500 pounds of bedding per animal stabled per year should be provided. Traffic through the bedded area must be kept at a minimum or bedding requirements will be greatly increased.

An earth floor in the bedded area is satisfactory in most cases. A type of construction which requires few or no posts is desirable for easy removal of the manure. Large doors through which a tractor mounted manure fork can be driven should be provided.

Kinds of bedding which have proved most satisfactory are shredded corn fodder, oat, wheat, barley and rye straw, dry sawdust, shavings or shavings and sawdust mixtures, swamp grass or other poor quality hay.

Insulation of the pen barn should not be attempted and no effort need be made to keep it warm. At times temperatures in the bedded area may go considerably below freezing, however, cows resting on the warm manure pack (temperature about 85 degrees F.) will be comfortable even though the air may be cold.



Fig. 10-11—Loafing area. This area is adjacent to the milking or holding pen and gives cattle free access to water and hay. Protection is available only if cows prefer it.

All or nearly all of the south or protected side of the loafing area should be left open to the paved barnyard. This gives the cows access to the yard at all times and provides what seems to be the only practical and satisfactory means of ventilation. If open doors are used as a means of ventilation rather than having one side of the barn open the doors should be arranged so that undue drafts will not be caused on the cows.

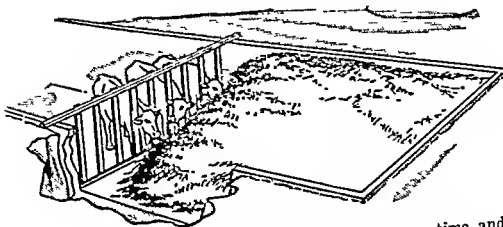


Fig. 10-12—Feeding gate for trench silo saves time and work. The gate is moved forward as the cows eat into the silage.

Paved Feeding Area

A separate paved feeding area should be provided for the feeding of hay and silage. Such an area cuts down materially on the bedding requirements in the loafing area.

The water trough or watering facilities should be located on the paved feeding area. Since temperatures at the paved area may be considerably below freezing in periods of cold weather adequate protection against freezing will have to be provided for the water system. A constant supply of fresh water into the tank is desirable. The water level in the tank should be maintained six to eight inches below the top to prevent the cows from lapping the water out onto the floor. An overflow pipe should be provided and be constructed in such a manner that no water will run into the loafing area or on the paved feeding platform.

Milking Area

The milking area includes the milking parlor and the milkhous. Milking parlors usually are of three general types, the conventional or stanchion type, floor level type with milking pit, and the elevated platform type. The conventional or stanchion type parlor can

frequently be used to advantage with the least expense when an existing barn is being remodeled into a pen barn, as a portion of the existing stanchions may be used. This type of milking parlor has the disadvantages of requiring the operator to stoop to put the milking machine on the cow and is not generally recommended.

With the elevated platform type of milking parlor, the cows walk up steps or a ramp to stalls which are elevated 30-36 inches above the work area. The floor level of the work area and the milkhouse are the same with this arrangement. In the pit type milking parlor, the cows stand at the general floor level and the operator works in the pit. Such an arrangement should not be used unless proper facilities for drainage are first provided. (From Cornell Univ. Bulletin No. 395.)

CHAPTER XI

MARKETING DAIRY PRODUCTS

Suggested Activities Which Involve Approved Practices

1. Marketing dairy products.
2. Choosing market outlet.
3. Assembling dairy products from farms.
4. Cooperation among creameries.
5. Hauling milk to city markets.
6. Marketing fluid milk.
7. Determining cost of distribution.
8. Preparing cattle for sale.
9. Fitting cattle for exhibition.
10. Photographing dairy cattle.
11. Lowering cost of production.

1. Marketing Dairy Products

For the most part farmers give their attention to producing farm products and turn the job of marketing over to so-called middlemen. About all the farmers attempt to do is to choose their best local market outlet. However, dairy farmers in many areas have been quite active in marketing the products they produce. They have done this largely by organizing farmer co-operatives. In fact, many cooperative dairy marketing organizations have been formed which market the dairy products of practically all farmers in an entire neighborhood. Generally, however, these cooperatives carry the product only part way through the entire marketing channel, not all the way to the final consumer.

Dairymen who sell to city fluid milk markets have formed "cooperative bargaining associations" through

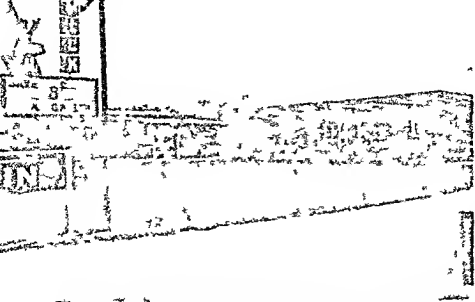


Fig 11 1—A modern way of marketing milk. This is a new drive in milk sales store Cars drive in to quickly purchase milk and milk products Many of these markets are owned by dairymen

which they bargain with milk dealers for the price to be paid for milk. The farmers do not handle the milk themselves They turn it over to dealers who take over all the operations of marketing

2. Choice of Market Outlet

Some dairy farmers are located in areas where the operator has a choice of market. He may sell to a creamery, a cheese factory, or a condensery, or he may even sell to a fluid milk market. Milk going to city fluid markets usually brings a noticeably higher price than milk going to manufactured uses In most areas of the country, however, there is an opportunity to sell to only one kind of market outlet. For example, you may live in a creamery area where butter, and only butter, is made. The only choice of market you have there is to sell your milk or cream to one of two or three different creameries Usually creameries in the same general area pay about the same price for milk—or butterfat.

Under those conditions your choice of market is very limited. The only real choice is to produce a high quality milk, or cream, which may return a slight premium above the price paid for milk of average or poor quality. Generally speaking, however, that premium doesn't amount to much. In areas where farmers have formed cooperative creameries or cheese factories they usually manufacture (make) the butter or cheese and sell it through a private marketing system. In some areas these cooperative creameries or cheese factories are hooked up with a marketing cooperative which does the marketing for them. The Land O'Lakes Cooperative with headquarters at Minneapolis, Minnesota is an illustration of such a cooperative. Land O'Lakes handles butter, cheese, condensed milk, and dry milk. For the most part Land O'Lakes sells these products to retail stores, mainly in the larger cities of the country. Only one marketing step is left—that of retailing. Farmers who are members of such a cooperative really own and operate their own marketing system.

3. Assembling Dairy Products from Farms

The first step in marketing is to move the milk or cream from the farms to the creamery, cheese factory, condensery or fluid milk market. This is called assembling, which means bringing together, or collecting into one place. The milk or cream is collected from many farms to the creamery, cheese factory or condensery where it is manufactured into butter, cheese, or condensed milk. Assembling is an important step in the marketing system and one where farmers can save considerable money by reducing waste and duplication of routes in bringing the dairy products together.

Years ago when dairying was getting started, roads were poor and hauling milk by horse drawn wagons—or sleighs in the winter—was slow and expensive. Small creameries or cheese factories were started wherever

there was a reasonable concentration of dairying. In many areas each farmer hauled his own milk or cream. The small creameries or cheese factories were inefficient and the cost of manufacturing dairy products was high. In order to reduce costs these small plants were later consolidated into larger ones, where modern machinery could be used more efficiently.

Fewer plants meant greater hauling distances and it was no longer economical for each farmer to haul his own milk. Instead, hauling routes were set up so one hauler could assemble milk from many farmers for a certain charge. Of course, these changes have come about gradually and they are still in progress today. There are still many small creameries and cheese factories, too small for efficient and low cost operation. Much improvement needs to be made and, for the most part, those improvements have to be made by farmers in an area working together on a cooperative basis. For example, the farmers need to work together to decide which of two or more small creameries or cheese factories should be combined in order to reduce cost of manufacturing. In some places it may pay to put up an entirely new, larger, modern, efficient creamery or cheese factory and dispose of the old ones for what they will bring.

Route trucks for most efficient pick-up—There is need for rearranging many truck routes to reduce the distance traveled and the cost of hauling the milk from the farms. In fact the job of reorganizing the routes and consolidating the smaller creameries or cheese factories into larger ones has to be worked out more or less as one operation to obtain the best results. According to Professor Geoffrey Shepherd of Iowa State College, a good deal can be saved by farmers through increasing the size of creamery and by reorganizing the creamery routes.

Determine proper creamery size—Previous studies



Fig 11-2—

- 1 Walk through barn. Some dairies may speed up milking and save labor by a walk through barn. Initial cost is low. Notice how all controls are from the rear of cows.
- 2 Learn new methods. Here a group of dairymen are learning a new, faster way of diagnosing pregnancy early.

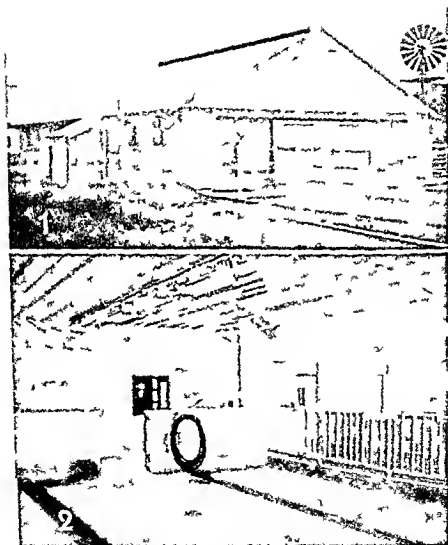


Fig 11 3—

- 1 An up-to-date dairy barn built of pumice type building blocks. Such buildings are fireproof windproof long lasting and insulated. Notice use of metal roofing and steel and concrete for corral construction. Courtesy Basalt Rock Co., Napa, Calif.
- 2 Interior of a modern dairy barn. Fluorescent lighting aluminum ceiling and steel for stanchions make sanitary and easy-to-clean interiors.

of creamery business problems have shown that costs decline as volume of the creamery increases, at least until the annual volume is larger than a half million pounds of butterfat. Comparisons have shown that creameries in the 500-thousand-pound class have an average advantage in operating costs of one cent or more per pound of butterfat over creameries manufacturing 200 to 250 thousand pounds.

The most efficient size from an operating standpoint is still larger than 500 thousand pounds.

What individual creameries can do—Individual creameries can do much to improve their efficiency. They can independently reorganize cream routes, obtain better control of them and minimize hauling costs. The creamery that succeeds in drawing even its present small volume of business from the smallest possible trade area gains a competitive advantage through lower hauling costs.

The prevailing system of paying truckers on a commission basis without designating the territory or the farmers they shall serve, the confusing methods of charging hauling costs to patrons, and the lack of effective control over hauling practices explain much of the inefficiency in obtaining cream by local creameries.

Many self-governing measures might be adopted voluntarily by the creameries. It might be desirable to supplement such industry action with appropriate legislation.

4. Cooperative Action Among Creameries

Although anything that can be done to place competition more definitely on the basis of efficiency is desirable, the concentration of butter manufacturing in fewer and more efficient plants would even then involve considerable time. The least efficient creameries would sooner or later be forced out of business, in most cases at considerable cost to present owners. Farmers patron-

izing such creameries in the meantime would be burdened with high costs

Since a reduction in the number of creameries seems inevitable, a quicker and more economical way of bringing about the adjustment in most cases would be by deliberate cooperative action on the part of farmers and creameries. The members or owners of two or three creameries in a given area might set up a new organization which would purchase the assets of several existing units. The new organization would make the most advantageous use of all facilities under its control and liquidate the surplus facilities.

On a larger scale, creameries in several counties might go together and on the basis of a careful survey and analysis of the whole area, establish several economic units. Still another plan would be for the dairy industry of the state to sponsor legislation which might provide for the voluntary establishment of districts for surveying and appraising the most economical butterfat marketing system. These districts might issue bonds which could be liquidated by means of a butterfat tax levied for the purpose in the district. Each of these different plans is being followed in various parts of the United States or in other countries.

It's up to farmers and creamery operators whether they permit nature to take its painful and long-drawn-out course or whether they deliberately reorganize their butterfat marketing system through a carefully planned program. Reorganizing the cream collection routes would save about one cent per pound and consolidating creameries would save an additional cent per pound. Here is a case where marketing costs could be reduced substantially by intelligent group action.

5 Hauling Milk to City Milk Markets

Eliminate duplication—Overlapping of farm truck routes is common in areas of city fluid milk markets as

well as in creamery areas. Wisconsin Bulletin No. 113 points out the waste in hauling milk from farms to a city market.

Flexible dairy plants—During the past several years creameries and cheese factories have been increased in size, but another change even more important has been the development of the so-called "flexible" dairy manufacturing plants. The flexible dairy plant is equipped to make several dairy products such as cheese, butter, or dried milk. Some of them are also equipped to handle fluid milk. The advantage of this kind of milk plant is that it can manufacture whatever dairy product which will bring the most favorable price. If butter is high compared with cheese the plant can make butter. If there is a good outlet for market milk they can change to it (providing, of course, that the milk is of high enough quality to meet city market requirements.) This type of plant is more common in the concentrated dairy areas. In the scattered dairy areas there isn't enough milk available within a reasonable distance so a flexible plant can operate efficiently because it is a type of plant that needs a large volume for efficient operation.

6. Marketing Fluid Milk in City Markets

Dairymen selling to fluid milk markets have given much more attention to marketing problems than have dairymen selling to manufacturing outlets. That is partly, or largely, because they have been in position to get good results. Their main efforts have been devoted to a system of bargaining with milk dealers for better prices, and also to set up a kind of a price plan under which milk would be paid for according to the use into which it went.

Bargaining with dealers—Some 25 years ago farmers selling milk to the larger fluid milk markets were discouraged with the low price for milk, so they set out

to get more money by bargaining with milk dealers on the price to be paid. At first they were only partly successful, but as time went on their power grew until they were able to increase their price considerably compared with the price for manufactured dairy products. Fluid milk bargaining associations are now common in most of the larger city markets over the country.

When the bargaining between producers and dealers got under way several years ago, one of the difficulties which milk dealers faced was that they could not sell all their milk for fluid use. Some of it had to be sold for manufactured uses at lower prices. Adjustments were made in the arrangements so that only the milk which was actually sold for fluid use was paid for at the fluid milk or "bargained" price. The milk which was left over from the fluid milk sale and had to be manufactured into cheese, butter or other dairy products was sold at a lower price. The more simple pricing plans are discussed in Wisconsin Bulletin 125.

Price plans in city markets—Fundamentally, there are only a few distinct types of price plans. There are, however, several variations from each plan and combinations of two or more plans. The more common plans are

- 1 The flat-price plan
- 2 The classification-price plan
- 3 The base surplus plan
- 4 The combination of the classification and the base-surplus plan

1 The flat price plan is common in the small cities and villages. A dealer pays all farmers the same price—a flat price—for all milk received, regardless of how much milk is turned to different uses by the dealer and regardless of the variation in seasonal production.

2 The classification price plan is one in which the dealer pays for milk according to the use he makes of it.

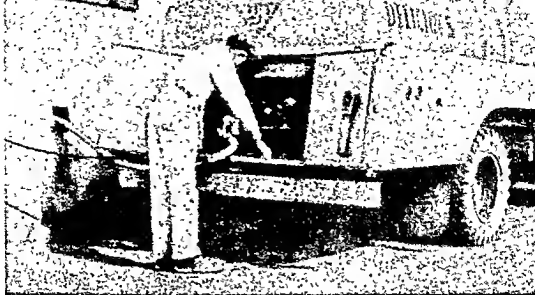


Photo Wisconsin Agriculturalist

Fig. 11-4—Milk is piped directly from the cooling tank to the tank truck. From there it is moved directly to the milk processing plant where it is pasteurized, bottled, cooled and finally delivered to the final consumer.

A relatively high price is paid for the amount a dealer sells as fluid milk. For the milk sold as cream a lower price is paid, and for that which is manufactured into butter, cheese, or evaporated milk, a still lower price is paid. The prices for these various classes are then averaged so that the same price is paid to all farmer-shippers, selling to one dealer, for the milk of a given test and grade. (In some markets only two classes, fluid and surplus, are considered, while in others three or more classes are recognized.)

Every dealer, of course, pays the same price for milk going to a particular use, such as fluid milk, but different dealers sell different proportions of milk for the various uses. One dealer may sell 75 per cent of his total milk receipts for fluid uses; another may sell only 50 per cent for this use. Thus, the one dealer will not pay the same average, or composite, price to his patrons as will the other.

In order that all dealers do pay the same average, or composite price, some producers' association have formed "market pools." Under this arrangement, every dealer turns his total payments over to the pool instead of paying his shippers direct, and the pool in turn pays

the producers. Thus, every producer receives the same average or composite price for his milk regardless of the dealer to whom he sells. In some other markets, an adjustment is made whereby distributors who have a small proportion of surplus pay an amount to the market pool, and those with a large proportion receive an amount from the pool, so that while every distributor pays his producers direct, all producers receive the same average price.

3 The base surplus plan, as first used in many markets, was primarily to encourage farmers to produce milk uniformly throughout the year. This feature of the plan has not been materially changed, and the usual method is to pay each individual farmer a relatively high price for an amount of milk each month, which is equal to his average monthly production during the previous fall months. The amount is called his base. For all milk in excess of this basic amount (surplus milk) the farmer is paid a lower price. Many variations occur but the fundamental feature of discouraging high summer production relative to the winter production by paying each farmer according to the seasonality of his volume is common to all.

4 The combination price plan is in reality a combination of the classification plan and the base surplus plan. In most places in the Middle West where the base-surplus plan is in effect, it is used in this combination. According to the combination plan the dealers pay for milk strictly according to the uses made of it, just as they do under the classification plan. The distribution of the money to the farmers, however, is made in the same way as under the base-surplus plan. In short, the classification feature of the combination plan applies to the dealers. The base-surplus feature applies to the farmers. In other words, the actual amount of money a dealer pays per 100 pounds of milk depends entirely upon what proportions of his milk receipts are sold as

fluid milk, as cream, and as manufactured dairy products. The individual farmer's average price, as compared with that of his neighbors who sell to the same dealer, depends upon how uniformly he maintains his production from month to month.

Any of the price plans are subject to modification to meet changing conditions. In fact, few producers' associations continue to adhere strictly to the original feature of any one plan.

In many of the larger city milk markets the pricing system has become extremely complicated, but in cities of medium size they are relatively simple. Whether they are simple or complex they have one general purpose—that of increasing the price which producers receive for milk over what it would be without a pricing plan. Farm bargaining associations have been very instrumental in improving prices to producers supplying the city markets.

7. Costs of Distributing Fluid Milk

According to the book on Milk Distribution by one of the writers the item of wages is the largest cost in distributing milk in cities. The book points out that out of every dollar expended for operation, an average of around 40-44 cents went for wages; 12 cents for salaries of officers, managers, and foremen; 8 cents for depreciation of buildings, equipment, and minor items; 3 cents for each of advertising and repairs; 2-2½ cents for each of the items of taxes, insurance, and bad debts; 3-3½ cents for the combined items of light and water; and the remainder of about 22-25 cents for "all other" items. While the degree of variation in the operating-cost items from company to company is relatively wide, it is largely negligible in the broader cost problem.

The book just referred to showed that while the cost of distributing fluid milk was high it was so largely

because of the many costs involved. The savings or profits of the milk distributors were relatively low for most distributors. Only the more efficient ones made more than average profits. Many of the smaller and less efficient distributors suffered losses during some years and came through with a reasonable profit during the years when they were more successful.

8. Preparing Cattle for Sale

The fitting of dairy cattle for private sale or public auction does not vary greatly from fitting dairy cattle for show. However, there are a number of approved practices to be followed:

Keep accurate records—Be specific on all points. Buyers wish to know breeding and calving dates. Guarantees should not be vague and breeders must be willing to back up what they say about their cattle. Herd bulls offered should be presented with a four generation pedigree. For most animals, however, three generation



Fig. 11-5—Properly fitting cattle preparatory to sale. Every animal should be trimmed and groomed so as to show its best.

pedigrees are sufficient. Honesty is the best policy, as the reputation of the breeder and his cattle are at stake. It is a desirable practice to have herd records and production record books available for prospective buyers to inspect.

Have cattle fitted and halter broken—Dairy cattle should be in good flesh but not fat. Gentle livestock early so animals will show off to their best advantage. By use of approved practices mentioned in the chapter on feeding, animals can be fed to reach their "bloom peak" at the time of sale. Well-mannered animals always show up better and attract attention from the buyers.

Offer only healthy cattle—Make the Bang's disease and T.B. tests within two to three weeks of the sale. Parasites, such as grubs or lice, should be controlled. Mastitis is the most important dairy disease at present. Any breeder who can guarantee his cattle mastitis free for a certain period after the sale, is in an advantageous position.

Advertise well—The amount of advertising will depend somewhat upon the number of cattle to be sold; however, do not neglect this point. Livestock journals, market papers, local and weekly newspapers, and radio are possibilities. Do not neglect neighbors, as they often turn out to be the best customers. If the sale demands a catalog, 500 to 600 copies should be enough. Get the best auctioneer possible. Do not overlook good local auctioneers. Many times they are more familiar with neighborhood traditions than an outsider and can swing their knowledge to sale advantage..

Have proper number of cattle—As a general rule, no sale should contain less than 35 or 40 head. More buyers will be attracted if some variety is offered in age and if both heifers and bulls are available. Good young stock, especially breed heifers, always attract new breeders and boys and girls just starting into dairying.

Provide the proper setting—The comfort of visitors and prospective purchasers should be considered at all times. A large pavilion or tent is recommended. Lunch and parking facilities should be readily available. Chutes and alleys must be so arranged that cattle can be moved in and out rapidly. A five-foot sale ring made of strong posts and wire netting is desirable in order that everyone can see. Keep the area wet down if dust becomes a problem. The use of extra help during the sale is a desirable practice. Your neighbors often prove to be your best source for help at such a time.

9. Fitting Cattle for Exhibition

Showing cattle at fairs and expositions is one of the best methods of advertising your stock. In addition, the breeder has an opportunity to see how his cattle compare with other cattle of the same breed. Shows are also the climax for feeding and fitting fat cattle. 4-H and FFA members can utilize livestock expositions to gain invaluable experience in feeding and training cattle for show.

Assemble proper equipment—Care should be taken to include all equipment needed for showing. A suitable hose and wash rack are necessary. Other equipment includes rope halters, show halters, scotch comb, washing brushes, lining combs, woolen rub rags, grooming oil, soap, water, feed buckets, and forks. After the equipment is assembled, utilize the following practices in training your animals:

Teach to lead—Time, patience, and practice are essential and will be rewarded. Calves should be fed until gentle and then taught to wear a halter. Do not attempt to teach a calf to lead until he no longer objects to being haltered. Try tying him while he is brushed. One should walk closely to the left side and let the calf move first if necessary. Be firm, but do not abuse or rush him. Never work animals so long that they be-

come too tired. Several short training periods are always better than a long one even though total time is equal.

Train to stand properly—Proper stance is for his feet to be placed squarely under him and well apart. A light stick about four feet long with a blunt nail driven crossways through the end is necessary for this part of the training. The point of the stick may be pressed high between the toes if it is wished to have him move his foot back. The nail may be hooked back of a dew claw and a slight pull will cause him to step forward. He should be taught to keep his head up in an alert position.

Show animal to best advantage—Keep your animals alert and at attention. They show themselves better. One side may make a better appearance than the other. Never show on uneven ground as standing in a hole or on a knoll will unbalance his conformation. He should be taught to stand at attention for at least ten minutes. However, an animal should not be worn out by too many strangers handling him or excessive prodding.

Trim the feet—Hooves that have been allowed to grow too long cause the animal to stand crooked and generally with the hind feet too far in under the body. Cattle kept continually on irrigated pasture are especially prone to this trouble. Hooves should be properly trimmed utilizing a pair of hoof nippers and chisel. A good set of stocks is necessary to hold the animal, otherwise it is a most difficult job. However, gentle cows can often be trimmed while they are stanchioned or halter tied.

Wash the animal—Tar soap is one of the best cleaning agents for washing cattle. The animal should be wet thoroughly and the soap rubbed over him until a good lather results. Care should be taken to rinse all soap out of his hair and water should not be allowed to get into his ears. The animal should not be washed



Fig. 11-6—Clipping the tail The switch should not be clipped, but washed, braided, and later combed out.

when he is hot. Washing should be done early enough in the morning so he will dry during the sunny part of the day. Once the coat is in good condition, brushing is all that is necessary until about five weeks before the show. After that he should be washed once each week. A weak chlorine or bluing solution may be used to bleach white spots and switches.

Clip the hair—Common practice is to clip around the head and ears as well as the udder, flanks, and milk veins. Tails are clipped to the switch so as to give them a slender effect.

Polish the horns—Horns and hooves can be scraped and sandpapered until they are bright, and a light-weight mineral oil rubbed on to brighten their appearance.

Properly show the animal—Enter the ring leading the animal from its left side. Hold him close with excess rope coiled. Follow in line moving deliberately.

Keep one eye on the judge. Face slightly uphill if possible, but be alert for judge's directions. When standing, square up the legs and straighten the top line by use of show stick on his belly. Normally move counter-clockwise, but don't shut off the judge's view. Talk to your animal. Whenever changing positions, back out of line by putting pressure on the animal's shoulder. Make certain the animal is standing squarely on its hind legs so the udder can be seen. Be dignified whether you win or lose by continuing to show your animal on the way out.

Consider your own appearance—A good showman is alert at all times. He should dress cleanly and neatly, and in keeping with the job of showing an animal. Use only small brushes, show sticks, etc., that are relatively inconspicuous.

10. Photographing Dairy Cattle

One of the best methods of advertising is by the proper use of good pictures of livestock. Catalogs can be made more effective if they include photographs of animals being offered for sale. In addition, breeders like to know how an animal looked as a calf or how the dam or sire of a calf appeared should they no longer be living. Records are more meaningful if they contain pictures. There are a number of approved practices to be followed in obtaining good photographs. If the animals are valuable enough, it might pay to have a professional photographer skilled in photographing dairy animals, take the pictures. However, many additional factors must be considered even then.

Properly fit the animal—Cattle should be prepared for a photograph just as though they were going to enter the show ring. Remove manure stains. Braid the switch when wet, and comb out when dry. Proper clipping is important, as mislaid hairs tend to magnify and detract from appearance. Good grooming will pay,

as it brings out the best points of an animal. Dairy stock must be in good health and well fed if they are to be photographed.

Select the proper growth stage—Animals should be in good condition and healthy. Select a time of year when the hair is long in order to get the best picture. Females look best just before calving. Young, growing animals often appear better one month than the next.

Avoid distracting background—Select a site where telephone poles, old machinery, etc., will not be visible. Lawn or a similar covering on the ground is a good location. Landscapes, such as a low, rising hill or hedge, make an ideal setting and do not detract from the animal. Feet should be squarely placed and head high.

Pose the animal—Make certain the animal is alert by waving a hat or in some way attracting its attention. Young animals should have the two feet nearest the camera well apart. Cows in milk should have the rear legs nearest the camera and the closest one slightly forward, but not so as to hide the teats. With groups such as get of sire, put the best animal closest to the camera, and the remainder of them slightly to the rear so that a clear view of udders is shown. Do not take pictures in the wind. Focus directly on the animal. The picture is slightly improved if the background is not sharp. Take the picture a little above the animal; never lower or from a kneeling position. Some animals may appear better on one side than the other.

Keep records—Age of the animal, stage of lactation, milk and butterfat production records, dates, and location are important if the photograph is to be used for most purposes.

Use only good pictures—Patience will be rewarded. Do not retouch pictures. If the picture does not turn out well, discard it. A poor picture is worse than none.

(Ref. Lattig and Nordby, "Selecting, Fitting, and

Showing Dairy Cattle," Interstate Printing Co., Danville, Illinois.)

11. Lowering Cost of Production

A higher price for milk will increase profit and so will lowering the cost of production. One of the major headaches of larger dairies is the labor problem, especially of milking. Not only are high wages involved but poor milkers mean less milk.

Share the expenses—Some dairymen believe the milker should share in the profits and also the expense so both parties have responsibilities. One practice which has merit is for the milker to receive 23 per cent of the gross milk check and also pay 23 per cent of all feed.

CHAPTER XII

KEEPING RECORDS OF THE DAIRY BUSINESS

Running a dairy herd without keeping records is like running a clock without hands. You see the activity but you can't see the results. Records provide information to show the strong and the weak spots in the dairy enterprise. Of course, records have real value only if you study and analyze them after they are summarized.

Maybe you have too few cows for a reasonable return from the herd. Perhaps all your cows are low producers. Perhaps some of them are good producers but others so low that you lose on them what you make on the good ones. Perhaps your feed costs are too high, either because you are paying an unduly high price for it or because you are not feeding the right kinds and amounts. A good set of records properly analyzed will tell you where you are going wrong. Records of your dairy business will much more than pay for the time and trouble of keeping them.

We shall discuss only the kind of records needed for the dairy enterprise (that is, the dairy business). The chapter will not cover the questions on complete farm records.

Many dairymen keep no records whatever. They depend on their memory for the items of income and expenses. That is very unsatisfactory. How many dairymen will remember what they got for milk, or for their calves and cows sold during the year? One is even more likely to forget the expense items. How many dairymen can remember at the end of the year what they paid out for feed, machinery repairs, labor, insurance, supplies, and a dozen other expense items? Per-

haps even more important, how will a dairyman know which cows made a profit because of high production and which ones actually lost money during the year? Records take guesswork out of the business.

Suggested Activities Which Involve Approved Practices

1. Determining kind of records to keep.
2. Taking inventory.
3. Determining costs.
4. Determining income.
5. Finding out what forms are needed.
6. Keeping a record of milk and butterfat production.

1. Kind of Records to Keep

The kind of records to keep will depend on what you want to know about the business. No one form of records will serve the purpose for everybody. It is of first importance that the records be simple, that they fit your purpose. A dairyman does not need to know the principles of bookkeeping to keep a usable set of dairy records. However, he should know how to analyze the records when they are completed and summarized at the end of the year.

You may want to ask yourself, what do I want to find out from the records? When that has been decided then the kind of records can be set up so as to answer those questions.

2. The Inventory

An inventory is an itemized list of goods with their estimated values. An inventory of your dairy enterprise (or dairy business) would include (1) a list of the live-stock (cows, heifers, calves and bulls), (2) dairy feeds on hand, (3) supplies, and (4) other items used in the



Courtesy New Holland Machine Co.

Fig 12 1—Valuable labor saving equipment like this must be properly inventoried and depreciated for tax purposes.

dairy enterprise. Such an inventory would be taken at the beginning, and again at the end of the year. The producing and breeding animals are naturally the most important part of this inventory. It involves the most money and forms the basis of the production of dairy products and young stock.

Feeds, both roughages and concentrates, that are on hand at the beginning of the year, or at the end of the year, supplies and other items are listed on the inventory sheet. (A sample of an inventory sheet is shown later in the chapter.) If some of these items, such as feeds, were listed at the beginning of the year, and only a part is used for the dairy enterprise, then adjustments should be made during the year so that only the amount actually used in the dairy enterprise is included in the beginning of the year inventory.

3. Determining Costs

Feed Produced or Purchased During Year

All the feeds raised on the farm during the year, or items purchased during the year, and used in the dairy enterprise, should be charged to it as an expense. This would include such items as grain, hay, silage, and other feedstuffs. The items purchased can be charged at the purchase price. The things produced on the farm are either at what they would bring if sold, or what similar items would cost if purchased. In the case of some items their value would have to be estimated.

Livestock Purchased During Year

When livestock are added to the dairy they should be charged as an expense to the dairy herd at their actual cost. Of course, if the dairy herd is kept separate from that of the dairy calves and heifers then the heifers are charged to the dairy enterprise at their value when they are inventoried into the herd.

Cost of Pasture

If pasture for the dairy herd is rented the amount paid as rent can be charged to the dairy enterprise. If the dairyman owns the pasture he has to estimate the value to the herd. He can make a fairly close estimate by determining the cost of fencing, fertilizing, drain-

ing, and what the taxes would amount to for the land used as pasture. If the pasture is used for beef cattle or other livestock in addition to the dairy herd, then the charge to the dairy herd has to be made on some reasonable basis.

Building and Equipment Costs

If the entire barn is used for the dairy herd then it is relatively easy to make the proper charge. Several things need to be considered such as the depreciation of the barn, interest on the investment, repairs, fire insurance, and other costs in connection with the barn as well as the equipment in the barn. The equipment varies from one farm to another, but here are some of the most common ones: the milking machine, feed conveyors, manure spreader and any other equipment such as trucks and tractors used in connection with the dairy enterprise.

Cost of Labor

Both man and horse labor (or tractor cost) used on the dairy enterprise is a cost and should be charged to the enterprise. Of course, if the feeds grown on the farm are already charged to the enterprise then there would be no charge made for horse labor (or tractor cost) for doing the field work on the feed crops. The only cost would be for hauling manure and other work around the barn.

Other costs—Several costs such as veterinary expense, breeding fees, transportation and other costs of marketing milk, or other dairy products and livestock, are costs to the dairy business and should be charged to it.

In summary, all the expenses of operating the dairy enterprise should be charged to it, and all income should be credited to it.

4. Income of the Dairy Enterprise

There are really two types of income from the dairy enterprise. One is the money income from the sale of milk or other dairy products such as cream, butter, or cheese, as well as for livestock sold such as veal calves, heifers, cows, or bulls. The second type of income is for dairy products or for animals slaughtered and used on the farm. These should be credited as an income to the dairy enterprise. They are usually figured at the market value.

5. Forms Needed for Keeping Dairy Records

The forms we are presenting here are only suggestive. They may have to be changed somewhat to suit the conditions on the particular farm. If complete farm accounts are kept then the accounts for the dairy enterprise may be included as a part of the over-all farm account.

The suggested forms presented here may be changed to suit the needs of your dairy herd and the conditions on your farm and especially to the other farm accounts that you keep. If you keep a complete farm accounting system you may want to include the accounts of the dairy herd in it and not keep separate accounts for the dairy enterprise.

A. INVENTORY OF ANIMALS

Beginning of Year		End of Year	
Name (or number) of animal	Value	Name (or number) of animal	Value
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		6.	
Total Value		Increase or Decrease of Animal's Inventory	

B. INVENTORY OF FEED, SUPPLIES, ETC.

Beginning of Year		End of Year	
Item	Value	Item	Value
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		6.	
		Increase or decrease of inventory \$	

C. RECORD OF RECEIPTS AND EXPENSES FOR THE DAIRY ENTERPRISE

Date	Expenses		Income	
	Expense Item	Amount	Income Item	Amount
1.				
2.				
3.				
4.				
5.				
6.				

D. COST OF BUILDINGS AND EQUIPMENT USED FOR THE DAIRY ENTERPRISE

Name of item	Number of items	Average value per item	Rate of depreciation	Total depreciation for year	Percent used by the dairy enterprise	Depreciation cost to the dairy enterprise
1.						
1.						
2.						
3.						
4.						
5.						
6.						

E. RECORD OF MAN AND HORSE LABOR AND TRACTOR COST USED ON THE DAIRY HERD

Month	Man Labor		Horse Labor			Tractor Cost		
	Kind of work done	Hrs. put in during month	No. of Horse hours used	Estimated rate per each for two-horse team	Estimated cost of horse labor	No. of tractor hours	Estimated rate per hour	Estimated tractor cost
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								
Total for year								

Items on page 280 can be calculated on the basis of the total of each of the items per animal or per mature dairy cow if the operator wishes to do so.

However, the most common method of calculating the income is the return per hour of labor for the operator.

The common method of arriving at the labor return is to include all hired labor at the rate actually paid as an expense. In the same manner family labor is included as an expense but on some estimated basis. If family labor is actually paid for then the actual amount paid can be charged as an expense. If it is not paid for then the operator will need to decide what would be a reasonable rate to charge as an expense against the dairy enterprise.

F. ANNUAL SUMMARY OF COSTS AND INCOME OF DAIRY ENTERPRISE

Costs			Income		
Item	Amt. or No.	Value	Item	Amt. or No.	Value
1. Inventory beginning of year			1. Inventory end of year		
a) Livestock			2a) Livestock		
b) Feeds			b) Feeds		
c) Supplies etc.			c) Supplies etc.		
2. Feeds bought			2. Livestock sold		
3. Feed raised on farm			3. Sale of milk and other dairy products		
4. Supplies bought			4. Dairy products used on the farm		
5. Livestock bought			5. Livestock from the dairy herd used		
6. Use of pasture			6. Manure from the dairy herd used on farm		
7. Use of buildings			7. Any other income from the dairy herd.		
8. Use of tractors					
9. Use of other equipment					
11. Man labor, hired— family— operator					
12. Horse labor					
13. Interest paid					
14. Interest calculated on investment					
15. Other costs					

Total Costs \$_____

Total Income during year \$_____

Net returns (or loss) during year \$_____

After all the expenses, including the hired labor and family labor, have been charged against the enterprise, then whatever balance is left over, as shown in Table F, will be labor income of the operator. This can be calculated as a total for the year or at the rate per hour for the time the operator actually put in the dairy enterprise.

6. Record of Milk Production of Individual Cow

Unless you keep a reasonably reliable record for each individual cow you have no way of knowing which ones are money makers and which are "boarders." You may be milking some of them "just for the fun of it." It may actually cost you money to keep them in the herd. You can't make money in the dairy business by keeping cows that don't pay their board. Good production records of individual cows will tell you which ones to sell.

DAILY MILK AND BUTTERFAT RECORD

MONTH OF _____

Name or No. of Cow		Cow No. 1			Cow No. 2		
		Lbs. milk	B. F. test	Lbs. B. F.	Lbs. milk	B. F. test	Lbs. B. F.
Lbs. & butterfat test							
Date	Time of day						
1.	A. M.						
	P. M.						
2.	A. M.						
	P. M.						
3.	A. M.						
	P. M.						
4.	A. M.						
	P. M.						

Total for month _____

Note: The up-and-down column is to be filled out for each day of the month and then the totals determined. The number of columns to the right will be determined by the number of cows in the herd—one for each cow.

MONTHLY MILK AND BUTTERFAT RECORD

Name or No. of Cow		Cow No. 1			Cow No. 2		
		Lbs. milk	B. F. Test	Lbs. B. F.	Lbs. milk	B. F. Test	Lbs. B. F.
Lbs. & Butterfat Test							
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							
Total for Year							

RECOMMENDED RECORD FOR INDIVIDUAL COW IN COMMERCIAL HERD

Dropped _____ Name _____ Herd No. _____

Purchased from _____ Bred by _____ Sold to _____

BREEDING RECORD

Date of Service	Number of Bull	Date of Calving	Sex of Calf	Name of Calf	Herd No.	Remarks

PRODUCTION RECORD

YEAR	MONTH	Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat		Milk		Fat	
------	-------	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--	------	--	-----	--

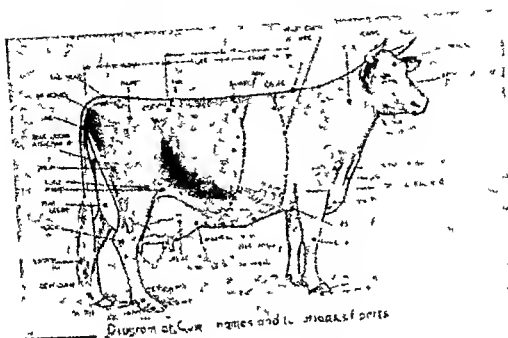
**SUMMARY OF MILK AND BUTTERFAT PRODUCTION
FOR THE YEAR FOR INDIVIDUAL COWS**

Name or No. of Cow	No. of lbs. of milk produced during year	Average Butterfat test	No. of lbs. of butterfat produced during the year

References

1. *Agricultural Bookkeeping*—McNall & McMurray, Longmans, Green & Co.
2. *Farm Accounting*—Donald R. Mitchell, McGraw-Hill Co.
3. *The Farm Management Handbook*—I. F. Hall & W. P. Mortenson, Chapter 23, The Interstate.
4. *Farm Accounting*—H. F. Scovill, D. Appleton & Company.
5. *Farm Accounts and Records*—J. Norman Effer-son, John Wiley & Sons.
6. *Approved Practices in Farm Management*—I. F. Hall & W. P. Mortenson, The Interstate.

GLOSSARY OF TERMS



Abortion—Refers to the expulsion or loss of the fetus before the completion of pregnancy.

Afterbirth—The membranes and tissues surrounding the fetus that are expelled from the uterus at parturition.

Bloat—Distension of the paunch as a result of an excessive amount of gas collecting in the rumen.

Breed—Animals who are genetically pure enough so as to have similar characteristics of color and conformation and when mated together will produce offspring with the same characteristics.

Breeding Rack—Equipment used to restrain females so breeding can be accomplished with little danger to animals or humans.

Bump—Method of determining pregnancy during the last few months of gestation. The right side of the cow is bumped sharply with the hand and the fetus swaying in fluid can be felt.

Butterfat—The fat element contained in milk. Butter is roughly 80 per cent butterfat.

Capacity—The ability of an animal to consume large amounts of feed. A large barrel and stomach often indicate an animal has good capacity.

Catch—Term used by livestock men to indicate conception has taken place after breeding.

Cistern—Area in the udder into which the milk is secreted before entering teat.

Clip—Removal of hair from the cow with shears—especially around udder, tail, etc.

Colostrum—The first milk produced after parturition. It is heavy and thick and yellowish to pink in appearance.

Concentrate—Feedstuffs high in percentage of total digestible nutrients and low in fiber and moisture.

Condition—Refers to the amount of fat on an animal.

Conformation—The shape and form of animals without respect to color.

Constitution—Indicates the general health and vigor of an animal.

Crossbreed—Practice of mating two different breeds to produce a crossbred offspring.

Cull—An animal below the standards of the animals in the remainder of the herd.

Dairy type—Refers to the conformation of animals which in turn indicates the purpose it serves, e.g., beef type vs. dairy type.

Dairy temperament—Visible signs of conformation, health and quality which indicate to the trained observer the animal will produce milk.

Daughter dam—Comparisons made between production records of daughters to their dams.

Dam—Female cow, mother of a calf.

DHIA—Dairy Herd Improvement Association.

<i>Diseases</i> —a. Anthrax	}	See chapter on Diseases
b. Brucellosis		
c. Milk fever		
d. T.B.		
e. Undulant fever		

Dry—Indicates cows are not in the lactating stage

Dual purpose—Cattle kept for the purpose of producing meat as well as milk.

Fitting—Process of preparing animals for exhibit or show.

Freemartin—Female calf to a bull twin—the female is practically always sterile although the bull is normal.

Freshen—Act of starting the lactating cycle directly after calving.

Gargot—Swollen condition of tissue just in front of udder at time of parturition. Erroneously applied to thick, stringy milk found in mastitis affected cows.

Genetics—Science of heredity which seeks to determine the phenomena involved in breeding.

Gestation—Time period between conception and parturition.

Globule—Small spherical particles of matter—especially refers to particles of butterfat in milk.

Grade—Offspring that is the result of one parent being purebred.

Grubs—Larvae of heel flies found in backs of cattle.

Handfeed—Feeding that is the result of the operator regulating the feed of each animal individually.

Heat—Period when the female will accept service by the male.

Heifer—Female cattle old enough to breed but who have not yet produced offspring. Many say a female under three years of age.

Heredity—Refers to the genetic background of an animal.

Hobble—Use of restraining equipment on legs of cows so they will not kick.

Hormone—Secretions of certain ductless glands in the body that can affect the physiology of an animal.

Inbreeding—Mating of closely related animals such as sire to daughter, brother to sister.

Lactation—Period when a cow is producing milk.

Legume—Plants belonging to the pea family and often high in protein. Extensively used as pasture plants in the dairy industry.

Lethal—Factors, especially hereditary, capable of causing death in resulting offspring.

Line breeding—A form of inbreeding. Refers to more distant relationships where a well-known family is constantly introduced into the breeding program, e.g., cousins.

Mammary veins—Veins carrying blood away from the udder and found just under the skin on the stomach of cattle.

Mastitis—Serious infectious, contagious disease of the udder of cattle.

Maternal Impressions—Misbelief that phenomena other than the physiology of the cow can affect the calf—e.g., black fence surrounding pregnant females yield black calves.

M.E.—*Mature equivalent*—refers to amount of milk a cow is capable of producing when mature.

Milk fever—Disease condition associated with parturition which results when certain minerals are lacking in the blood stream.

Milk solids—Part of milk resulting after water is removed.

Milk veins—Veins carrying blood away from the udder

and found just under the skin on the stomach of cattle.

Milk well—Area on body of cows where milk veins enter body cavity.

Niche—Animals who, when mated, produce excellent offspring are said to "niche" well.

Nurse cow—Cows used for purpose of nursing calves.

Outcrossing—Introduction of outside blood into a herd.

Palpation—See rectal palpation.

Parturition—Act of calving.

Pasteurize—Process of increasing temperature of milk so as to render it disease free.

Pedigree—Record of ancestral background of individual animals.

Polled—Animals naturally hornless.

Pregnant—Female with fetus en utero.

Proved—Animals whose transmitting ability is known. May be good or poor.

Purebred—Animal resulting from the mating of two animals of the same breed who can trace their lineage in association herd books.

Ration—Strictly speaking, amount of food an animal receives in 24 hours.

Rectal palpation—Process of finding the new fetus inside the cow by putting one's hand up the rectum and feeling (palpation) the unborn calf or developing tissue.

R.M.—*Register of Merit*—Used by certain breeds to indicate a degree of excellence.

Roughage—Foodstuffs relatively low in total digestible nutrients and high in roughage, e.g., hay.

Rumen—First stomach of the cow.

Rumination—Act of regurgitating food from the rumen.

Service—Refers to act of breeding in cattle.

Sib—Term used to indicate brother-sister testing.

Sire—Male of cattle capable of producing offspring.

Skim milk—Milk resulting after butterfat has been removed.

Springing—Evidence such as full sides and loose vulva that parturition is approaching.

Stanchion—Process of holding cattle by equipment which secures them around the neck.

Stocks—Restraining equipment used to hold livestock while trimming feet, etc.

Strip—The last milk obtained from the milking process which is high in butterfat.

Succulent—Soft, watery feeds relatively low in fiber.

Supplement—Additional feed used to improve a common ration such as pasture.

Telegony—Misbelief that previous matings affect future offspring, e.g., cows bearing calves by one sire will have future calves influenced by him even though future calves are by different sire.

Transmit—Process whereby genetic characteristics are carried from parents to offspring.

Udder—Mammary organ of cow that produces milk.

Veal—Young cattle sold for meat, generally around 12 weeks old and well fed so they have not lost their baby fat.

Wean—Condition when young calf is no longer fed milk.

Whole milk—Milk as it comes directly from the udder with nothing removed.

APPENDIX

CHAPTER I

Opportunities in Dairying

1. A cheap source of roughage must be available before obtaining a family cow.
2. It is essential that the family cow be free from all known diseases transmissible to humans.
3. Utilize surplus man hours by caring for dairy cows on part-time farms.
4. Breed all cows to calve during the most abundant feed period in seasonal dairying.
5. Produce market milk or manufacturing milk according to long-time market price in a given area.
6. Under most conditions enter the purebred business by first developing a paying commercial herd.
7. Learn about cow pools.
8. Mechanize your farm.
9. Study future trends.

CHAPTER II

Selecting the Breeding Herd

1. Select a type of dairying that best suits local market demands and your type of farm.
2. Select for individual excellence rather than a particular breed. Do not ignore personal preference in choosing a breed.
3. Purchase cattle on their home farm.
4. Select animals according to type, production, and pedigree whenever possible. Standardize all records before making comparisons.
5. Choose heifers from proven ancestry. Bulls must be chosen that are capable of raising the production of the herd into which they will be placed.

CHAPTER III

Building Up the Dairy Herd

1. Select one system of breeding and stay with it.
2. Raise three heifer calves for every ten cows in the herd.
3. Freshen cows according to market demands and feed supply.
4. Use breeding stocks or artificial insemination for young heifers.
5. Test cows regularly for Bang's disease. Vaccinate all calves at 6 to 8 months of age.
6. Cull all cows that must be rebred four times.
7. Test the entire herd for butterfat production at monthly intervals. Join an improvement association.
8. Don't borrow bulls.

CHAPTER IV

Handling the Dairy Herd

1. Keep cows quiet and undisturbed during freshening time.
2. Make certain the new-born calf is breathing and gets some of the colostrum milk.
3. Dehorn and mark for identification at an early age.
4. Let heifers run with the milking herd for one month before freshening.
5. Milk cows rapidly and completely. Wash and massage the udder just before milking.
6. Dry up most cows by simply turning them out to pasture.
7. Have some coarse roughage available at all times in order to help prevent bloat.
8. Raise your own replacements. Practice sanitation for the prevention of disease.

CHAPTER V

Raising the Dairy Calf

1. Remove the calf from its dam early (one or two days) so they do not become too attached to each other.
2. Keep calf pen clean at all times.
3. Make no sudden changes in feeding.
4. Feed 1 pound of milk daily for each 10 pounds of calf weight.
5. Provide good quality legume roughage at all times.
6. Skim milk is excellent for raising calves, but should not be used after 6 months of age unless very economically obtained.

CHAPTER VI

Feeding the Dairy Herd

1. Find a cheap source of roughage before entering the dairy business. Legume hay, silage, and permanent pastures are excellent dairy feeds.
2. Feed a balanced ration including necessary minerals.
3. Feed producing cows according to production. Low producers need no concentrates for economical production.
4. Buy feeds according to their nutritive value. As a rule high quality feed is the cheapest to buy.
5. Beware of feeding large amounts of concentrates unless they can be economically obtained.
6. Buy roughage on a quality basis.
7. Stress greater use of roughage.

CHAPTER VII

Controlling Parasites and Diseases

1. Prevent diseases by utilizing proper sanitation and prevention methods.
2. Large, clean pastures are a must in disease prevention.
3. Separate sick cattle immediately.
4. Guard against internal parasites on permanent pastures by cleaning up water holes.
5. Consult a veterinarian or county agent for serious reproductive diseases, like Bang's disease.
6. Protect udders against mechanical injury and unsanitary practices so as to prevent mastitis.

CHAPTER VIII

Producing High Quality Milk

1. Clip hair on udders regularly.
2. Provide a holding pen for cows to relax in just before they enter the milking barn.
3. Wash cows' udders and attachments before each milking.
4. Maintain sterile milking equipment.
5. Hire only clean milkers.
6. Control insects in the milking parlor.

CHAPTER IX

The Farm Milkhouse

1. Locate milkhouse for convenience and ease of operation.
2. Use permanent materials like concrete for construction.
3. Provide adequate lighting and electric service throughout.

4. Ventilate the milkhouse as well as the milking parlor.
5. Provide plenty of hot water and adequate refrigeration.
6. Modern sinks, insulation, and milk handling equipment are essential for success and ease of handling.

CHAPTER X

The Dairy Barn

1. Plan barns carefully so as to conserve time and labor.
2. Determine the kind of housing according to climate, geography, and size of herd.
3. Be certain new construction will more than satisfy State Agricultural Codes.
4. Do not become over capitalized with farm buildings. Most cows require little protection if shade is available and cattle can be kept out of drafts and dry.
5. Use paved areas whenever possible so as to eliminate mud in winter.

CHAPTER XI

Marketing Dairy Products

1. Select the market outlet best suited to your farm.
2. Eliminate all possible overhead costs, such as duplicate trucking costs.
3. Sell good surplus stock as a valuable by-product.
4. Fit cattle for sale just as though they were going to be exhibited.
5. Maintain your reputation as a breeder by a reasonable guarantee.
6. Share profits and expenses with the milker.

CHAPTER XII

Keeping Records of the Dairy Business

1. Keep records of production as well as the cost of running the dairy business.
2. Make entries promptly, accurately, and up to date.
3. Analyze records annually to determine what changes must be made in operation of the dairy.
4. Cull all cows that do not yield a profit as determined by their individual production records.
5. Keep records in such a condition that other people will know what they mean.

Index

	Page		Page
A		Commercial Dairying ---	
Abortion	189	Condition	17
Adapted	28	Concentrate Feeds	79
Advanced Records	76	Cooperatives	157
Afterbirth	82	Corral Dairying	257
Age	76	Cost	19
Agencies	49	Cow Pools	275
Anaplasmosis	198	Cow Pox	23
Antibiotic	129, 131, 163	Crossbreeding	201
Antibodies	117	Cull	52
Approved Practices		Culling	36
Artificial Breeding	58		72
Artificial Insemination	64	D	
Associations	48	D.H.I.A.	76
Automatic Calf Feeder	126	Dairy Barn	204
Ayrshire	30	Defects	42
B		Dehorn	83
Babcock	74	Dehorning	138
Balancing	169	Developing Herd	77
Bang's	70	Drafts	104
Barn Cleaner	234	Dry-lot	19
Breeding	50, 60	Drying Up	91
Breeds	30	Dual Purpose	17, 35
Beliefs	72	Dutch Belted	35
Bloat	106, 180	E	
Brown Swiss	30	Ear Tagging	123
Brucellosis	188	Escapes	103
Bulk Tank	226	Exercise	69, 95
Bull	94	Extra Teats	136
Bullpen	102	External Parasites	144
Bump	66	F	
Butterfat	74	Family Cow	12
Buying	173	Feeding	116, 147, 173
C		Fitting	266
Calf	111	Feeding Gate	249
Calf Ailments	141	Flavors	168
Calf Pen	113	Flies	105, 135, 185
Calf Starter	121	Floors	223
Calving	81, 110	Fluid Milk	20, 259
Capsules	118	Foot Rot	197
Carcass	180	Forage Harvester	24
Carotene	131	Formulas	123
Caustic	138	Fortified	129
Chopping	155	Freemartin	56
Choke	182	Freshening	79
Chute	99	G	
Clipping	88, 268	Gains	145
Colostrum	82, 85, 112	Gates	102

	Page		Page
Gestation Table	62	Milking Machine	210, 213
Glossary	285	Milking Shorthorn	35
Grasses	152	Minerals	122, 150
Grubs	136, 187		
Guernseya	31	N	
H		Navel	83
H. I. R.	76	Nurse Cow	84, 127
Handling	92	Nutrition	59
Hardship	100	O	
Hay	153	Opportunities	11
Hazard	100	Outcrossing	51
Heat Period	53, 65	Overfeeding	119
Hazards	178	P	
Heifer	33, 41	Parasites	183
Holding Pen	88	Part-time Dairying	15
Holstein	31	Pedigree	40, 44
Hoofs	95	Percentage Calf Crop	69
Hormones	164	Personal Reason	30
Horn Button	96	Photographing	269
I		Phenothiazine	185
Identification	84	Pink Eye	201
Inbreeding	51	Pneumonia	143
Information	48	Poisoning	167
Injury	80	Prevention	177
Internal Parasites	144	Pregnant	65
J		Pre-milking	87
Jersey	33	Price Plan	260
Judging	73	Progeny	43
K		Proved	57
Kicking	87	Proteins	159
L		Purebred Dairying	20
Laxative	80	Q	
Legumes	149	Quality	52
Lice	186	Quarters	93
Leptospirosis	191	R	
Limited Whole Milk	120	Rack	64
Linebreeding	51	Ratio	68
Loafing Area	247	Rations	130
Loose Housing	243	Records	67, 273
M		Red Danish	34
Management	87	Red Poll	36
Manufacturing Milk	18	Refrigeration	226
Market Milk	18	Register	94
Marketing	252	Replacements	54
Mastitis	107, 192	Replacement Heifer	22, 34
Mechanical Feeding	161	Reproduction	60
Milk Substitutes	124	Reproductive Diseases	188
Milk Fever	82, 195	Reproductive Troubles	192
Milk Flavor	178	Research	26
Milkhouse	220	Ring	97
Milking	87	Ringworm	143, 200
		Roughage	129, 149, 170

S

Safety Device	100
Sales	264
Sanitation	108, 177
Saving Labor	234
Score Card	38
Scours	141
Scrub	43
Seasonal Dairying	16
Selecting	29, 36, 47
Separated Milk	18
Service	68
Shipping	98
Shipping Crate	101
Shipping Fever	100, 196
Shy Breeder	71
Silage	131
Sire	43, 56
Silo	156
Skim Milk	125
Slippage	179
Soy Bean Hay	152
Springing	22
Sprinklers	90
Stalls	238
Stanchion Barn	236
Standardize	40
Standardized Records	76
Starting	53
Stimulate	214
Stocks	64
Storage	154
Strainers	209
Strip	215
Systemic Poisons	136

T

Tattooing	85, 135
Teatcup	216
Temperature	114
Testing	37
Training	86
Trends	23
Trichomoniasis	180
Tonic	162
Toxic Feeds	166
Type	27, 38
Type Classification	74

U

Udder	81, 89, 112
Urea	165

V

Vaccinate	70
Veal	13, 14, 128
Ventilated	140
Ventilation	225
Vertical Integration	25
Vitamin	122, 132

W

Warts	201
Weaning	128
Weigh	126
Whole Milk	127
White Scours	142
Worms	183